# G-Probe 25b — an International Proficiency Test for Microanalytical Laboratories — Report on Round 25b (Speleothem, KCSp-1NP, Nano-particulate powder pellet) / December 2021

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## Abstract

Results are presented for Round 25b of the G-Probe Proficiency Testing programme for microanalytical laboratories, organised by the International Association of Geoanalysts (IAG). The test material distributed in this round of G-Probe was the speleothem nano-particulate powder pellet, KCSp-1NP, prepared at Kiel University. This is the first time that a carbonate material in the form of a nano-particulate powder pellet has been the subject of G-Probe. As well as offering an innovation and new opportunities in proficiency testing, use of this carbonate nano-pellet also presents some new challenges and unfamiliar obstacles, e.g., the very low mass fractions of many trace elements in speleothem carbonate material and the porosity of the powder pellets. In this report, the data contributed by 25 laboratories are listed, together with an assessment of consensus values as composition location estimators, consequent *z*-scores and a series of charts that show the distribution of contributed results and reveal the overall performance of participating laboratories. Assigned values were conferred for 8 elements, and provisional values for a further 8, out of 61 elements reported. However, for 16 of those elements, an insufficient number of laboratories reported results to allow data distributions to be formally assessed.

## Introduction

This twenty-fifth round of G-Probe, the international proficiency testing programme for microanalytical laboratories, was conducted in a similar manner to recent rounds. The programme is organised by the IAG and is conducted in a manner that conforms with the recently published G-Probe Protocol (IAG, 2020).

To accommodate difficulties encountered with shipments and delays in laboratory readiness due to the Coronavirus pandemic, the original deadline for submission of results for this round was extended by several weeks with the benefit that 25 laboratories reported their results. All data submitted were processed using the online system, which also provided the automated sections of this report.

The overall aim of the programme is to provide participating laboratories with *z*-score information for their reported measurement results so that each laboratory can decide whether the quality of their data is satisfactory in relation both to the G-Probe fitness-for-purpose criterion and to the results submitted by other laboratories contributing to the round. In circumstances where *z*-scores are unsatisfactory, a participating laboratory is encouraged to investigate its procedures for unsuspected analytical bias and to take corrective action if it appears justified. The programme is designed to be part of the routine quality assurance procedures employed by microanalytical geochemistry laboratories.

## G-Probe Steering Committee:

D. Garbe-Schönberg (principal organiser and producer of powder pellets), P.C. Webb (results coordinator and website administrator), P.J. Potts (results reviewer), J. Woodhead (supplier of original material), M. Thompson (statistical advisor), C.J.B. Gowing (distribution coordinator), L. Danyushevsky, R. Mertz-Kraus and A. Kronz (analytical advisors).

## Timetable for Round 25b of G-Probe:

Distribution of test material: June 2021
Results submission deadline: 6th October 2021
Release of report: December 2021

## G-Probe 25b Test Material details

The speleothem starting material for this test sample originated from a Pliocene calcitic speleothem sampled from shallow caves beneath the arid Nullarbor plain of South Australia (Woodhead et al., 2019) and was supplied by Jon Woodhead of the University of Melbourne, Australia. This sample was chosen as a first attempt to provide a potential carbonate reference material with concentration profiles similar to many real-world materials, especially those typically encountered by the palaeoclimate research community. For analysis of such materials the commonly employed NIST glasses can prove problematic as calibrants – not only because of the potential for matrix-related complexity – but also the fact that some elements of immediate interest (e.g., Mg) are only present at trace level in NIST glasses. A pure calcite speleothem (with no obvious detrital contamination) was chosen in order to provide a relatively homogeneous starting product and, from several hundred potential candidates, this particular sample was chosen because of its optimal levels of Mg, Sr, U and Ba.

The sample was first pulverized at the University of Melbourne and then further processed to an ultra-fine grain size at Kiel University following a modified wet-milling protocol with high-energy ball mills as detailed in Garbe-Schönberg and Müller (2014). In total, about 200 g original powder was processed with 30 individually milled batches. Participants were alerted to the fact that the nano-particulate materials of this pellet are hygroscopic and were advised to store the pellet in a desiccator and/or under vacuum. They were also advised that many trace elements are at very low mass fractions in this material so that special attention should be paid to the limits of detection of the procedure used. One pellet was distributed to each participant.

For homogeneity testing following ISO Guide 35:2017 (ISO, 2017) subsets of 10 pellets were distributed to 4 international laboratories for analysis of 10 points per pellet by LA-ICP-MS to assess between-pellet heterogeneity. In addition, one pellet was analysed at 100 points for estimating within-pellet micro-heterogeneity. All 30 batches of nano-powder were analysed for Sr/Ca and Mg/Ca ratios by ICP-OES, and 28 batches by solution ICP-MS for bulk composition at the University of Kiel. After careful assessment of all these homogeneity data, the speleothem “nano-pellets” were considered suitable for use in this proficiency test.

## Submission of results

For G-Probe 25b, participants were instructed to apply their routine measurement procedures to provide one measurement result for the nano-particulate powder pellet representative of its average composition (Result A), however, 5 laboratories provided two measurements, results A and B.

A total of 708 measurement results, submitted by 25 laboratories, are listed in Table 1. Where results A and B were provided, the average was used for the subsequent data assessment. Of the resultant 604 individual values reported for 61 analytes, 557 values were by LA-ICP-MS from 22 laboratories, 26 by EPMA from 5 laboratories, and one laboratory provided 21 values without defining its method.

## Target values and results summary

Robust statistical procedures were used to derive a consensus value from the contributed data for each elemental component in the test material. These procedures included the evaluation of the Huber robust mean, the median for the dataset and a mode derived from a kernel density distribution as detailed by Thompson (2017). Evaluations of appropriate consensus values involved a critical assessment of distributions of results from ordered sequential charts for each analyte.

Consensus values were credited with assigned status on the basis that:

(i) sufficient laboratories had contributed data for estimating a measurand (usually a minimum of 15);

(ii) visual assessment gave confidence that a substantial proportion of the results distribution was symmetrically disposed about the consensus;

(iii) the ratio of the uncertainty in the location estimate to the target precision (as defined below) was an acceptably small value; and

(iv) where possible, an evaluation of measurement results by procedure was judged to provide no clear evidence of procedural bias among the measurement results from which the consensus was derived.

Where these criteria were nearly, but not fully met, measurands were credited with 'provisional' rather than 'assigned' status. Instances of provisional status were identified because either:

(i) a smaller number of results (less than 15 but more than 8) contributed to the consensus, or

(ii) the results were unduly dispersed in relation to the target precision ($H_a$, see below), or

(iii) the distribution of results was significantly skewed (but not severely enough to preclude the recognition of a clear consensus), or

(iv) procedural bias was identified in some of the contributed data but a target value could nevertheless be recognised based on the most coherent part of the overall data distribution conforming approximately to a random sample from a normal distribution.

Where data were either insufficient in number, or the distribution was too variable or too highly skewed for the confident estimation of a consensus to provide *z*-scores, data distributions are presented 'for information' only.

The resulting consensus values credited with assigned or provisional status were those judged to be the best available estimates of the true composition of the test material and therefore suitable for use as target values for proficiency testing. It should be noted, however, that in many cases, these estimates are derived from a single analytical method.

Data distributions for those analytes given assigned or provisional status are presented in Figure 1, and those for which no status could be conferred are shown for information in Figure 2. Measurement results in the Figure 1 and 2 data distribution plots are presented in order of increasing magnitude and identified according to laboratory code. Data symbols are coded by colour and shape according to the method of measurement. The majority of results were obtained by LA-ICP-MS, and for a limited number of major elements and S by EPMA.

For trace elements there is no option other than to make assessments based on LA-ICP-MS data, and therefore concerns about the possibility of single method bias, noted above, must be kept in mind and the outcomes should be regarded with caution in the reflection of true values. Nevertheless, the derived consensus values represent the best that currently can be obtained and therefore are considered appropriate for the purposes of this proficiency test.

Several laboratories in this round required values of a major element oxide for internal standardisation of LA-ICP-MS data. Laboratories coded E2, E13, E16, E23, E31, E32 and E45 were instructed that estimates of CaO could be based on stoichiometry. Inspection of the results provided by these participants showed no detectable evidence that the use of these values had been responsible for any significant bias in datasets. However, three laboratories (E22, E25, E46) appear to have reported and possibly used the $CaCO_3$ mass fraction instead of the corresponding CaO value for standardisation purposes and therefore their results are always anomalous.

Table 2 lists assigned and provisional values for one major component and 15 trace elements in G-Probe 25b (KCSp-1NP). Data distribution charts for the 16 measurands that were judged to have satisfactory distributions for consensus values to be conferred with assigned or provisional status are shown in Figure 1. These are: $Al_2O_3$*, As*, Ba, Ce*, Cu, Ga*, La*, Li*, Mn, Ni*, Pb*, Sr, U, V, Y, and Zr. Of these, values of the 8 analytes marked '*' were credited with provisional status for reasons given above.

Data distribution plots for the 30 analytes: $SiO_2$, $TiO_2$, $Fe_2O_3T$, MgO, CaO, $Na_2O$, $K_2O$, $P_2O_5$, B, Co, Dy, Er, Eu, Gd, Ge, Hf, Ho, Lu, Nb, Nd, Pr, Rb, S, Sc, Sm, Ta, Th, W, Yb and Zn are plotted in Figure 2 for information only, as the data were either insufficient in number, or the data distribution was too highly dispersed or too highly skewed for the confident estimation of a consensus for provision of *z*-scores. Approximate values for many of these elements are included in supplementary Table 0.1 for reasons outlined below.

Relatively few analytes could be credited with assigned or provisional status (compared with "normal" G-Probe rounds using silicate rock test materials), mainly because many trace elements were present at very low mass fractions which fell below the detection limits of the techniques employed. Therefore, this test material was more challenging than usual both for analysts and for the estimation of appropriate consensus values. Where few data are available there is a great deal of uncertainty attached to any value that might be considered plausible. Table 0.1 lists potential values, tentatively estimated, where normal assessment is not possible on account of too few data, or data that is generally too variable. It is considered that such approximations can provide some guidance for analysts to judge whether their results are broadly within the range of values derived by other participants. However, it is not justified to report uncertainties in these cases. Although the listed values for $TiO_2$, Dy, Er, Hf, Nb, Pr, W and Yb and possibly Nd, Sc and Th could be regarded as the more credible based on their data distributions, there was insufficient data to make any positive assessment.

## Observations

Test materials presented as pressed powder pellets have been used in previous G-Probe rounds e.g., GP-4 (carbonate MACS-3), GP-10 (phosphate MAPS-4), GP-20 (ultra-milled basalt glass GSD-2G-NP), and this is a strategy for presenting materials that cannot be prepared as homogenous glasses or minerals. However, powder pellets are characterized by some porosity that may challenge analysis by EPMA. This issue, along with the presence of the carbonate matrix may be a cause for systematically low CaO in EPMA results, whereas other EPMA results for major elements e.g., $SiO_2$, MgO were compatible with LA-ICP-MS results.

With vanishingly small quantities of many of the constituents of this test material, it is not altogether surprising that fewer measurands than usual could be credited with a defined status. However, it was disappointing that results were not more coherent for many constituents, especially some components apparently present in comfortably measurable mass fractions such as $SiO_2$, MgO and $Na_2O$, and trace elements such as B, Cr, Sc and Zn, and therefore that they could not be assessed more positively. A significant number of "high tails" have been observed, especially in data distributions for $Fe_2O_3$ and $P_2O_5$, though the consequence for plots in Table 2 is for such data to be missing as it plots outside the limits of the graph. The general tendency for an appreciable number of measurement results to be too high in this round led to frequent use of the mode as the most appropriate estimator of central tendency.

Impurities from small inclusions were detected in some of the pellets during the homogeneity pre-tests. Such anomalies can be easily detected and excluded from data integration during post-processing of LA-ICP-MS data prior to submission. Indeed, no comparable anomalies in $TiO_2$, $Fe_2O_3$, Ce, Cr, Ga, Mo, Ni, Pb, Sc, W, Zn, and Zr data were detected in the distributions of contributed data.

Some preliminary data from ICP-MS bulk analysis of 28 batches of nano-powder are provided in Table 0.2. The molar ratio for Sr/Ca of 0.861 mmol/mol as determined during this round compares to 0.838 mmol/mol derived from bulk analysis of 30 batches of nano-powder by ICP-OES, and a Mg/Ca molar ratio of 34.7 mmol/mol compares well with 35.3 mmol/mol from bulk ICP-OES data. These bulk analyses also confirmed excellent homogeneity of Sr/Ca and Mg/Ca between all 30 batches of nano-particulate powder with values within 0.5 %RSD (2SD). The Ba/Ca molar ratio of 9.44 µmol/mol from this round compares to 9.87 µmol/mol in the bulk data and the U/Pb molar ratio of 170 reproduced exactly the same value as in the preliminary solution bulk data by ICP-MS. However, the database for bulk composition of KCSp-1NP is too small for a valid comparison with values from this G-Probe round.

## *Z*-score analysis

Assessment of submitted results followed the strategy adopted in recent rounds of G-Probe (Wilson et al. 2019; Wilson et al. 2020; Garbe-Schönberg et al. 2021) and detailed in the G-Probe protocol (IAG, 2020). Based on an assessment of the variation of measurement results in earlier rounds, and in order to provide sufficient discrimination for the proficiency test to be helpful to participating laboratories, the fitness for purpose criterion applied throughout was provided by the modified Horwitz function:

$$H_a = k.X_a^{0.8495}$$

where $H_a$ is the standard deviation for proficiency, also referred to as the target precision, for each measurand; $X_a$, represented as a mass fraction, is the best estimate of the true composition, also known as the 'target value' (and may be credited with assigned or provisional status). The factor k = 0.01, which is regarded as appropriate for laboratories working to a 'pure geochemistry' standard of performance, where analytical results are designed for geochemical research and where care is taken to provide data of high precision and accuracy, sometimes at the expense of a reduced sample throughput rate.

*Z*-scores were calculated for the average measurement result submitted by each laboratory from:

$$z = [X - X_a] / H_a$$

where $X$ is the (average) measurement result submitted, $X_a$ is the target value (assigned and provisional) and $H_a$ is the target precision (all as mass fractions).

*Z*-score values for results submitted to G-Probe 25b are listed in Table 3. *Z*-scores derived from provisional values of measurands are shown in italics.

Participating laboratories are invited to assess their performance using the following criteria:

> *Z*-score results in the range $-2<z<2$ are considered to be 'satisfactory' (in the sense that no action is called for by the participant). If the *z*-score for any element falls outside this range, especially if it is outside the range $-3<z<3$, laboratories are advised to examine their procedures and, if necessary, take action to ensure that their determinations are not subject to unsuspected analytical bias.

Should a participating laboratory decide that this performance standard is not appropriate for assessment of their measurement results, they are invited to recalculate their *z*-scores by substituting the appropriate value of the standard deviation for proficiency testing, $H_a$, into the equation for the calculation of *z*-scores (i.e. $z = [X - X_a] / H_a$ ). Adoption of such an approach should include a justification as to why an amended value of $H_a$ is more appropriate for assessment of their data.

## Overall performance

A summary of the overall performance of individual laboratories for this round is plotted in multiple *z*-score charts in Figure 3. In these charts, the *z*-score performance for each element is distinguished by symbols that make it easy to identify whether the measurements results were satisfactory or gave *z*-scores that exceeded the action limits. This chart is designed to help individual laboratories judge their overall performance in this proficiency test. Note, however, that participants should always review their *z*-scores in accordance with their own fitness-for-purpose criteria.

## Participation in future rounds

The benefit from proficiency testing arises from regular participation and laboratories are invited to contribute to Round 26 of G-Probe, the test samples for which will be distributed in spring 2022.

## Acknowledgements

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## ADDENDUM— IMPORTANT NOTICE TO ANALYSTS

### Change in uncertainty estimation for medians:

Note that in 2020 a change was made to the algorithm for estimating the uncertainty of median values compared to that used in previous rounds of G-Probe. The revised procedure was implemented for the first time for round 24 (G-Probe 24). As described in the new G-Probe protocol (IAG, 2020), median uncertainties are now increased by a factor of 1.2533. Therefore, when comparing uncertainties from this and future rounds with those from rounds previous to Round 24, those uncertainty values previously reported for medians should be increased by this factor.

**Table 0.1 Potential values, tentatively estimated, for analytes that were reported in insufficient numbers or were generally too variably disposed for formal assessment.**

| | Potential value ($g\ 100g^{-1}$) | Number of laboratories reporting |
|---|---|---|
| **$SiO_2$** | 0.80 | 21 |
| **$TiO_2$** | 0.000063 | 8 |
| **$Fe_2O_3T$** | 0.005 | 18 |
| **MgO** | 1.33 | 21 |
| **CaO** | 54.1 | 17 |
| **$Na_2O$** | 0.063 | 18 |
| **$K_2O$** | 0.0017 | 13 |
| | **($mg\ kg^{-1}$)** | |
| **B** | 2.8 | 14 |
| **Co** | 0.029 | 14 |
| **Dy** | 0.00098 | 7 |
| **Er** | 0.001 | 7 |

| | Potential value ($mg\ kg^{-1}$) | Number of laboratories reporting |
|---|---|---|
| **Gd** | 0.0013 | 5 |
| **Hf** | 0.0011 | 7 |
| **Ho** | 0.00027 | 6 |
| **Lu** | 0.00015 | 4 |
| **Nb** | 0.0021 | 6 |
| **Nd** | 0.0023 | 7 |
| **Pr** | 0.00058 | 7 |
| **Rb** | 0.022 | 13 |
| **Sc** | 0.14 | 10 |
| **Sm** | 0.00076 | 4 |
| **Th** | 0.00058 | 8 |
| **Yb** | 0.001 | 7 |

**Table 0.2 Preliminary bulk analysis data for selected elements from homogeneity pre-tests by solution ICP-MS (medians of 28 batches of nano-powder).**

| | Median value ($g\ 100g^{-1}$) | 2 SD ($g\ 100g^{-1}$) |
|---|---|---|
| **$TiO_2$** | 0.000064 | 0.000032 |
| **Al2O3** | 0.00061 | 0.0000072 |
| **$Fe_2O_3T$** | 0.00063 | 0.00009 |
| | **($mg\ kg^{-1}$)** | **($mg\ kg^{-1}$)** |
| **As** | 0.65 | 0.068 |
| **B** | 0.9 | 0.36 |
| **Ba** | 13 | 0.5 |
| **Co** | 0.05 | 0.020 |
| **Cr** | 0.06 | 0.026 |
| **Cu** | 3.5 | 0.6 |
| **Li** | 0.14 | 0.07 |
| **Mn** | 0.28 | 0.04 |
| **Ni** | 0.8 | 0.12 |
| **Pb** | 0.02 | 0.0014 |
| **Rb** | 0.029 | 0.005 |
| **Sc** | 0.4 | 0.06 |
| **Sr** | 736 | 21 |

| | Median value ($mg\ kg^{-1}$) | 2 SD ($mg\ kg^{-1}$) |
|---|---|---|
| **U** | 3.4 | 0.11 |
| **V** | 0.14 | 0.026 |
| **W** | 0.017 | 0.0012 |
| **Y** | 0.017 | 0.0014 |
| **REEs** | | |
| **La** | 0.0044 | 0.0022 |
| **Ce** | 0.0086 | 0.0052 |
| **Pr** | 0.0009 | 0.0004 |
| **Nd** | 0.0033 | 0.0012 |
| **Sm** | 0.0011 | 0.00018 |
| **Gd** | 0.0015 | 0.00026 |
| **Tb** | 0.0002 | 0.00002 |
| **Dy** | 0.0012 | 0.00012 |
| **Ho** | 0.0003 | 0.00002 |
| **Er** | 0.0010 | 0.00014 |
| **Tm** | 0.0002 | 0.00004 |
| **Yb** | 0.0011 | 0.00014 |

## Table 1 - G-Probe 25b Contributed data for Calcitic speleothem, KCSp-1NP Pellet. 06/10/2021

| Lab Code | | E2A | E2B | E3A | E3B | E5A | E5B | E8A | E8B | E11A | E11B | E13A | E13B |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SiO2 | g 100g$^{-1}$ | 0.95 | | | | 0.874 | 0.9 | 0.7404 | | 0.754184933 | | 0.747 | |
| TiO2 | g 100g$^{-1}$ | | | | | | | | | 0.0000601 | | 0.00024 | |
| Al2O3 | g 100g$^{-1}$ | | | | | 0.0015 | 0.0014 | 0.000536 | | 0.000729 | | 0.00074 | |
| Fe2O3T | g 100g$^{-1}$ | 0.14 | | | | | | 0.000627 | | 0.00617 | | 0.00537 | |
| MgO | g 100g$^{-1}$ | 1.51 | | | | 1.583 | 1.579 | 1.328 | | 1.343526231 | | 1.5 | |
| CaO | g 100g$^{-1}$ | 55.04 | | | | 53.38 | 53.35 | 53.32 | | 53.25511198 | | 56.03 | |
| Na2O | g 100g$^{-1}$ | 0.06 | | | | 0.065 | 0.064 | 0.0581 | | 0.0778 | | 0.0618 | |
| K2O | g 100g$^{-1}$ | | | | | 0.0018 | 0.0016 | 0.00111 | | 0.00334 | | 0.0014 | |
| P2O5 | g 100g$^{-1}$ | 0.01 | | | | | | 0.00385 | | 0.00322 | | 0.00472 | |
| Ag | mg kg$^{-1}$ | | | | | | | 0.00413 | | | | | |
| As | mg kg$^{-1}$ | | | | | | | 1.47 | | 1.555194506 | | 1.3 | |
| Au | mg kg$^{-1}$ | | | | | | | | | | | | |
| B | mg kg$^{-1}$ | | | | | 4.61 | 2.99 | 2.88 | | 2.599644314 | | 3.46 | |
| Ba | mg kg$^{-1}$ | 12.55 | | 12 | | 13.42 | 13.91 | 12.2 | | 12.38031868 | | 12.32 | |
| Be | mg kg$^{-1}$ | | | | | | | 0.0151 | | | | | |
| Bi | mg kg$^{-1}$ | | | | | | | | | | | | |
| Br | mg kg$^{-1}$ | | | | | 30.13 | 28 | | | | | | |
| Ce | mg kg$^{-1}$ | 0.01 | | 0.008 | | | | 0.00594 | | 0.00782 | | | |
| Cl | mg kg$^{-1}$ | | | | | 175.4 | 93.5 | | | | | | |
| Co | mg kg$^{-1}$ | 0.24 | | | | | | 0.0284 | | 0.0304 | | | |
| Cr | mg kg$^{-1}$ | 0.16 | | | | 4.2 | 1.97 | 0.0905 | | 0.0881 | | | |
| Cs | mg kg$^{-1}$ | | | | | 0.015 | 0.011 | | | | | | |
| Cu | mg kg$^{-1}$ | 5.01 | | 4.94 | | 4.71 | 4.82 | 4.483 | | 4.553296609 | | 3.44 | |
| Dy | mg kg$^{-1}$ | | | 0.002 | | | | 0.000797 | | 0.000946 | | | |
| Er | mg kg$^{-1}$ | | | 0.001 | | | | 0.000774 | | 0.000739 | | | |
| Eu | mg kg$^{-1}$ | | | | | | | 0.000583 | | 0.00149 | | | |
| Ga | mg kg$^{-1}$ | 0.02 | | | | | | 0.0207 | | 0.0229 | | | |
| Gd | mg kg$^{-1}$ | | | 0.002 | | | | 0.00067 | | | | | |
| Ge | mg kg$^{-1}$ | 0.02 | | | | 0.436 | 0.45 | | | | | | |
| Hf | mg kg$^{-1}$ | | | 0.001 | | | | 0.00106 | | 0.00113 | | | |
| Ho | mg kg$^{-1}$ | | | | | | | 0.000216 | | 0.000286 | | | |
| In | mg kg$^{-1}$ | | | | | | | | | | | | |
| La | mg kg$^{-1}$ | | | 0.004 | | | | 0.00302 | | 0.00308 | | | |
| Li | mg kg$^{-1}$ | | | | | | | 0.1176 | | 0.133305934 | | | |
| Lu | mg kg$^{-1}$ | | | | | | | 0.000112 | | | | | |
| Mn | mg kg$^{-1}$ | 0.25 | | | | | | 0.2406 | | 0.290731909 | | 0.27 | |
| Mo | mg kg$^{-1}$ | | | | | | | | | 0.00237 | | | |
| Nb | mg kg$^{-1}$ | | | | | | | 0.002 | | 0.00191 | | | |
| Nd | mg kg$^{-1}$ | | | 0.004 | | | | 0.00195 | | 0.00267 | | | |
| Ni | mg kg$^{-1}$ | 0.94 | | 1.28 | | 1.57 | 2.3 | 0.9145 | | 0.998147352 | | 1.04 | |
| Pb | mg kg$^{-1}$ | 0.02 | | 0.055 | | 0.021 | 0.033 | 0.017 | | 0.0208 | | 0.036 | |
| Pd | mg kg$^{-1}$ | | | | | | | | | | | | |
| Pr | mg kg$^{-1}$ | | | 0.001 | | | | 0.000588 | | 0.000715 | | | |
| Rb | mg kg$^{-1}$ | 0.02 | | 0.025 | | | | 0.0172 | | 0.0501 | | | |
| Re | mg kg$^{-1}$ | | | | | | | | | | | | |
| S | mg kg$^{-1}$ | | | | | | | | | | | | |
| Sb | mg kg$^{-1}$ | | | | | | | | | | | | |
| Sc | mg kg$^{-1}$ | 0.13 | | | | | | | | 0.149385777 | | | |
| Se | mg kg$^{-1}$ | 0.55 | | | | | | | | | | | |
| Sm | mg kg$^{-1}$ | | | 0.001 | | | | | | | | | |
| Sn | mg kg$^{-1}$ | 0.11 | | | | | | 0.025 | | 0.0492 | | | |
| Sr | mg kg$^{-1}$ | 750.3 | | 641 | | 745 | 731 | 656.1 | | 693.7784294 | | 723.88 | |
| Ta | mg kg$^{-1}$ | | | | | | | 0.000153 | | 0.000249 | | | |
| Tb | mg kg$^{-1}$ | | | | | | | 0.000134 | | | | | |
| Th | mg kg$^{-1}$ | | | 0.001 | | 0.0015 | 0.001 | 0.000589 | | 0.00058 | | | |
| Tl | mg kg$^{-1}$ | 0.01 | | | | | | 0.00446 | | | | | |
| Tm | mg kg$^{-1}$ | | | | | | | 0.000125 | | | | | |
| U | mg kg$^{-1}$ | 3.57 | | 3.42 | | 3.54 | 3.38 | 3.056 | | 3.196244351 | | 3.4 | |
| V | mg kg$^{-1}$ | 0.16 | | 0.161 | | 0.14 | 0.4 | 0.1304 | | 0.147435376 | | 0.133 | |
| W | mg kg$^{-1}$ | 0.01 | | | | | | 0.011 | | | | | |
| Y | mg kg$^{-1}$ | 0.02 | | 0.017 | | | | 0.0154 | | 0.0225 | | 0.013 | |
| Yb | mg kg$^{-1}$ | | | 0.001 | | | | 0.000653 | | 0.00106 | | | |
| Zn | mg kg$^{-1}$ | 0.3 | | | | 0.643 | 0.559 | 0.2065 | | 0.200127043 | | | |
| Zr | mg kg$^{-1}$ | 0.26 | | 0.246 | | 0.271 | 0.211 | 0.2301 | | 0.24493791 | | 0.24 | |

### Table 1 - G-Probe 25b Contributed data for Calcitic speleothem, KCSp-1NP Pellet. 06/10/2021

| Lab Code | | E14A | E14B | E15A | E15B | E16A | E16B | E22A | E22B | E23A | E23B | E24A | E24B |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SiO2 | g 100g$^{-1}$ | 0.757 | | 0.728 | | 0.87 | | 1.501 | 1.418 | 0.968 | | 0.851 | |
| TiO2 | g 100g$^{-1}$ | | | 0.00006 | | | | | | | | | |
| Al2O3 | g 100g$^{-1}$ | | | 0.00068 | | | | 0.001 | 0.001 | 0.00064 | | | |
| Fe2O3T | g 100g$^{-1}$ | | | 0.0082 | | | | 0.01 | 0.013 | 0.0033 | | | |
| MgO | g 100g$^{-1}$ | 1.45 | | 1.384 | | 1.36 | | 2.739 | 3.7735 | | | 1.379 | |
| CaO | g 100g$^{-1}$ | 51.48 | | 54.99 | | | | 93.623 | 93.622 | | | 51.691 | |
| Na2O | g 100g$^{-1}$ | | | 0.0723 | | 0.06 | | 0.126 | 0.124 | | | | |
| K2O | g 100g$^{-1}$ | | | 0.00034 | | 0.001 | | 0.02 | 0.03 | | | | |
| P2O5 | g 100g$^{-1}$ | | | 0.00273 | | 0.008 | | 0.07 | 0.06 | 0.0092 | | | |
| Ag | mg kg$^{-1}$ | | | | | | | | | | | | |
| As | mg kg$^{-1}$ | | | 1.379 | | 1.54 | | | | | | | |
| Au | mg kg$^{-1}$ | | | | | | | | | | | | |
| B | mg kg$^{-1}$ | | | 2.338 | | 6.94 | | | | | | | |
| Ba | mg kg$^{-1}$ | 11.55 | | 13.5 | | 12.6 | | 23.365 | 21.319 | 12.26 | | | |
| Be | mg kg$^{-1}$ | | | 0.0126 | | | | | | | | | |
| Bi | mg kg$^{-1}$ | | | | | | | | | | | | |
| Br | mg kg$^{-1}$ | | | | | | | | | | | | |
| Ce | mg kg$^{-1}$ | | | 0.00606 | | 0.0064 | | 0.16 | 0.14 | 0.006 | | | |
| Cl | mg kg$^{-1}$ | | | | | | | | | | | | |
| Co | mg kg$^{-1}$ | 0.184 | | 0.0363 | | 0.083 | | 0.112 | 0.087 | | | | |
| Cr | mg kg$^{-1}$ | | | | | 0.7 | | 2.037 | 1.01 | 3.107 | | | |
| Cs | mg kg$^{-1}$ | | | 0.00169 | | | | 0.05 | 0.05 | | | | |
| Cu | mg kg$^{-1}$ | 4.58 | | 4.956 | | 4.73 | | | | | | | |
| Dy | mg kg$^{-1}$ | | | 0.000985 | | | | 0.009 | 0.007 | | | | |
| Er | mg kg$^{-1}$ | | | 0.000986 | | | | 0.01 | 0.007 | | | | |
| Eu | mg kg$^{-1}$ | | | 0.000537 | | | | 0.004 | 0.003 | | | | |
| Ga | mg kg$^{-1}$ | | | 0.0279 | | 0.028 | | 0.039 | 0.037 | 0.023 | | | |
| Gd | mg kg$^{-1}$ | | | 0.000773 | | | | 0.015 | 0.012 | | | | |
| Ge | mg kg$^{-1}$ | | | | | | | 0.179 | 0.254 | | | | |
| Hf | mg kg$^{-1}$ | | | 0.00107 | | | | 0.006 | 0.005 | | | | |
| Ho | mg kg$^{-1}$ | | | 0.000515 | | | | 0.002 | 0.002 | | | | |
| In | mg kg$^{-1}$ | | | | | | | | | | | | |
| La | mg kg$^{-1}$ | | | 0.00326 | | 0.0039 | | 0.006 | 0.005 | | | | |
| Li | mg kg$^{-1}$ | | | 0.1305 | | 0.13 | | 0.162 | 0.228 | | | | |
| Lu | mg kg$^{-1}$ | | | | | | | 0.002 | 0.002 | | | | |
| Mn | mg kg$^{-1}$ | 0.247 | | 0.274 | | 0.22 | | | | 0.267 | | | |
| Mo | mg kg$^{-1}$ | | | 0.00164 | | | | | | | | | |
| Nb | mg kg$^{-1}$ | | | 0.00188 | | | | 0.015 | 0.012 | | | | |
| Nd | mg kg$^{-1}$ | | | 0.00259 | | | | 0.012 | 0.011 | | | | |
| Ni | mg kg$^{-1}$ | 1.177 | | | | 1.4 | | 2.143 | 1.581 | 1.214 | | | |
| Pb | mg kg$^{-1}$ | | | 0.0187 | | | | 0.031 | 0.032 | | | | |
| Pd | mg kg$^{-1}$ | | | | | | | | | | | | |
| Pr | mg kg$^{-1}$ | | | 0.000552 | | | | 0.003 | 0.002 | | | | |
| Rb | mg kg$^{-1}$ | | | 0.0255 | | 0.022 | | 0.054 | 0.048 | 0.031 | | | |
| Re | mg kg$^{-1}$ | | | | | | | | | | | | |
| S | mg kg$^{-1}$ | 1432 | | | | | | | | | | 1474.4 | |
| Sb | mg kg$^{-1}$ | | | | | | | | | | | | |
| Sc | mg kg$^{-1}$ | | | 0.1644 | | 0.028 | | 0.12 | 0.093 | | | | |
| Se | mg kg$^{-1}$ | | | | | | | | | | | | |
| Sm | mg kg$^{-1}$ | | | 0.000522 | | | | 0.016 | 0.013 | | | | |
| Sn | mg kg$^{-1}$ | | | | | 0.23 | | | | | | | |
| Sr | mg kg$^{-1}$ | 661 | | 739.3 | | 722 | | 1228.266 | 1223.298 | 719.8 | | 684.5 | |
| Ta | mg kg$^{-1}$ | | | 0.000546 | | | | 0.002 | 0.002 | | | | |
| Tb | mg kg$^{-1}$ | | | | | | | 0.002 | 0.002 | | | | |
| Th | mg kg$^{-1}$ | | | 0.000523 | | | | 0.002 | 0.002 | | | | |
| Tl | mg kg$^{-1}$ | | | | | | | | | | | | |
| Tm | mg kg$^{-1}$ | | | | | | | 0.002 | 0.002 | | | | |
| U | mg kg$^{-1}$ | 3.092 | | 3.437 | | 3.61 | | 7.084 | 5.981 | 3.415 | | | |
| V | mg kg$^{-1}$ | 0.15 | | 0.1635 | | 0.16 | | 0.323 | 0.273 | 0.151 | | | |
| W | mg kg$^{-1}$ | | | 0.0114 | | | | | | 0.012 | | | |
| Y | mg kg$^{-1}$ | 0.018 | | 0.0191 | | 0.016 | | 0.033 | 0.024 | 0.016 | | | |
| Yb | mg kg$^{-1}$ | | | 0.000983 | | | | 0.011 | 0.008 | | | | |
| Zn | mg kg$^{-1}$ | | | 0.256 | | 1.28 | | | | | | | |
| Zr | mg kg$^{-1}$ | 0.232 | | 0.265 | | 0.25 | | 0.491 | 0.347 | 0.233 | | | |

## Table 1 - G-Probe 25b Contributed data for Calcitic speleothem, KCSp-1NP Pellet. 06/10/2021

| Lab Code | | E25A | E25B | E26A | E26B | E31A | E31B | E32A | E32B | E35A | E35B | E40A | E40B |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $SiO_2$ | $g\ 100g^{-1}$ | 3.23 | | 0.81 | 0.76 | | | 0.7988 | | 0.82 | | 0.6653 | |
| $TiO_2$ | $g\ 100g^{-1}$ | 0.74 | | | | | | 0.000065 | | 0.007 | | | |
| $Al_2O_3$ | $g\ 100g^{-1}$ | 0.01 | | | | | | 0.000732 | | 0.01 | | 0.000053 | |
| $Fe_2O_3T$ | $g\ 100g^{-1}$ | 0.046 | | 0.06 | 0.06 | | | 0.00471 | | 0.01 | | 0.00071 | |
| MgO | $g\ 100g^{-1}$ | 3.47 | | 1.33 | 1.37 | | | 1.546 | | 1.45 | | 1.26 | |
| CaO | $g\ 100g^{-1}$ | 92 | | 53.86 | 54.66 | | | | | 51.2 | | | |
| $Na_2O$ | $g\ 100g^{-1}$ | 0.18 | | 0.06 | 0.04 | | | 0.0728 | | 0.06 | | 0.067 | |
| $K_2O$ | $g\ 100g^{-1}$ | 0.074 | | | | | | 0.00168 | | 0.003 | | | |
| $P_2O_5$ | $g\ 100g^{-1}$ | 0.09 | | | | | | 0.00332 | | 0.009 | | | |
| Ag | $mg\ kg^{-1}$ | 0.44 | | | | | | | | | | | |
| As | $mg\ kg^{-1}$ | | | 1.22 | 1.68 | 1.61 | | | | | | | |
| Au | $mg\ kg^{-1}$ | | | | | | | | | | | | |
| B | $mg\ kg^{-1}$ | | | 6.39 | 5.56 | 2.52 | | | | | | 2.933163465 | |
| Ba | $mg\ kg^{-1}$ | 32.7 | | 12.51 | 12.07 | 12.5 | | 13.4 | | | | 12.71167843 | |
| Be | $mg\ kg^{-1}$ | | | | | | | | | | | | |
| Bi | $mg\ kg^{-1}$ | 0.071 | | | | | | | | | | | |
| Br | $mg\ kg^{-1}$ | | | | | | | | | | | | |
| Ce | $mg\ kg^{-1}$ | 0.21 | | | | | | 0.009 | | | | | |
| Cl | $mg\ kg^{-1}$ | | | | | | | | | | | | |
| Co | $mg\ kg^{-1}$ | 1.33 | | 0.11 | 0.11 | 0.019 | | 0.027 | | | | | |
| Cr | $mg\ kg^{-1}$ | 7.3 | | | | 1.24 | | | | 62 | | | |
| Cs | $mg\ kg^{-1}$ | 0.13 | | | | | | | | | | | |
| Cu | $mg\ kg^{-1}$ | 13.2 | | 4.74 | 4.94 | 4.66 | | 4.924 | | | | 4.814878638 | |
| Dy | $mg\ kg^{-1}$ | 0.35 | | | | | | | | | | | |
| Er | $mg\ kg^{-1}$ | 0.25 | | | | | | | | | | | |
| Eu | $mg\ kg^{-1}$ | 0.18 | | | | | | | | | | | |
| Ga | $mg\ kg^{-1}$ | 1.24 | | 0.03 | 0.03 | 0.024 | | | | | | | |
| Gd | $mg\ kg^{-1}$ | 0.4 | | | | | | | | | | | |
| Ge | $mg\ kg^{-1}$ | | | 0.04 | 0.04 | | | | | | | | |
| Hf | $mg\ kg^{-1}$ | 0.25 | | | | | | | | | | | |
| Ho | $mg\ kg^{-1}$ | 0.11 | | | | | | | | | | | |
| In | $mg\ kg^{-1}$ | | | | | | | | | | | | |
| La | $mg\ kg^{-1}$ | 0.16 | | | | | | 0.004 | | | | | |
| Li | $mg\ kg^{-1}$ | | | 0.13 | 0.14 | 0.167 | | 0.14 | | | | 0.145893952 | |
| Lu | $mg\ kg^{-1}$ | 0.081 | | | | | | | | | | | |
| Mn | $mg\ kg^{-1}$ | 0.0008 | | | | | | 0.29 | | 70 | | 0.273179504 | |
| Mo | $mg\ kg^{-1}$ | | | | | | | | | | | | |
| Nb | $mg\ kg^{-1}$ | 0.38 | | | | | | | | | | | |
| Nd | $mg\ kg^{-1}$ | 0.41 | | | | | | | | | | | |
| Ni | $mg\ kg^{-1}$ | 6.89 | | 1.09 | 1.09 | 1.02 | | 1 | | 76 | | | |
| Pb | $mg\ kg^{-1}$ | 0.25 | | | | 0.062 | | 0.019 | | | | 0.0153 | |
| Pd | $mg\ kg^{-1}$ | | | | | 0.071 | | | | | | | |
| Pr | $mg\ kg^{-1}$ | 0.12 | | | | | | | | | | | |
| Rb | $mg\ kg^{-1}$ | 0.69 | | 0.01 | 0.02 | 0.083 | | 0.028 | | | | | |
| Re | $mg\ kg^{-1}$ | | | | | | | | | | | | |
| S | $mg\ kg^{-1}$ | | | 1196.96 | 1088.33 | | | | | | | | |
| Sb | $mg\ kg^{-1}$ | 0.29 | | | | | | | | | | | |
| Sc | $mg\ kg^{-1}$ | 6.75 | | 0.09 | 0.16 | 0.051 | | | | | | | |
| Se | $mg\ kg^{-1}$ | | | | | 0.297 | | | | | | | |
| Sm | $mg\ kg^{-1}$ | 0.36 | | | | | | | | | | | |
| Sn | $mg\ kg^{-1}$ | 0.68 | | | | | | | | | | | |
| Sr | $mg\ kg^{-1}$ | 18900 | | 715.72 | 690.93 | 748 | | 737 | | | | 721.4056547 | |
| Ta | $mg\ kg^{-1}$ | 0.09 | | | | | | | | | | | |
| Tb | $mg\ kg^{-1}$ | 0.088 | | | | | | | | | | | |
| Th | $mg\ kg^{-1}$ | 0.082 | | | | | | | | | | | |
| Tl | $mg\ kg^{-1}$ | 0.11 | | | | | | | | | | | |
| Tm | $mg\ kg^{-1}$ | 0.091 | | | | | | | | | | | |
| U | $mg\ kg^{-1}$ | 7.61 | | 3.49 | 3.56 | 3.42 | | 3.22 | | | | 3.37050933 | |
| V | $mg\ kg^{-1}$ | 3.82 | | 0.17 | 0.17 | 0.148 | | 0.141 | | | | 0.156589668 | |
| W | $mg\ kg^{-1}$ | 0.32 | | | | | | 0.011 | | | | | |
| Y | $mg\ kg^{-1}$ | 0.46 | | 0.01 | 0.01 | 0.014 | | 0.015 | | | | 0.0147 | |
| Yb | $mg\ kg^{-1}$ | 0.25 | | | | | | | | | | | |
| Zn | $mg\ kg^{-1}$ | 11.2 | | 0.23 | 0.33 | 0.365 | | 0.258 | | | | | |
| Zr | $mg\ kg^{-1}$ | 1.08 | | 0.26 | 0.24 | 0.226 | | 0.242 | | | | 0.233969932 | |

## Table 1 - G-Probe 25b Contributed data for Calcitic speleothem, KCSp-1NP Pellet. 06/10/2021

| Lab Code | | E41A | E41B | E42A | E42B | E43A | E43B | E45A | E45B | E46A | E46B | E50A | E50B |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SiO2 | g 100g$^{-1}$ | 0.657 | | | | 0.317 | | | | 1.11 | | 0.859 | 0.86 |
| TiO2 | g 100g$^{-1}$ | 0.000067 | | | | 0.00005 | | | | | | | |
| Al2O3 | g 100g$^{-1}$ | 0.00076 | | 0.000688 | | 0.00087 | | | | | | | |
| Fe2O3T | g 100g$^{-1}$ | 0.006 | | 0.0115 | | 0.0019 | | | | 0.02 | | 0.016 | 0.016 |
| MgO | g 100g$^{-1}$ | 1.2 | | 1.24 | | 0.817 | | | | 2.84 | | 1.31 | 1.309 |
| CaO | g 100g$^{-1}$ | | | 54.6 | | 37.6 | | | | 95.73 | | 53.108 | 53.108 |
| Na2O | g 100g$^{-1}$ | | | 0.0643 | | 0.0539 | | | | 0.1 | | 0.062 | 0.062 |
| K2O | g 100g$^{-1}$ | 0.0017 | | 0.00139 | | | | | | | | | |
| P2O5 | g 100g$^{-1}$ | 0.0056 | | 0.00305 | | 0.0021 | | | | 0.01 | | | |
| Ag | mg kg$^{-1}$ | | | | | | | | | | | | |
| As | mg kg$^{-1}$ | 1.59 | | | | | | | | 1.88 | | | |
| Au | mg kg$^{-1}$ | | | | | | | | | | | | |
| B | mg kg$^{-1}$ | 23 | | 5.84 | | 1.2 | | 2.71 | 2.65 | | | | |
| Ba | mg kg$^{-1}$ | 13.7 | | 12.2 | | 9.46 | | 14.9 | 15.05 | 27.55 | | 12.31 | 12.39 |
| Be | mg kg$^{-1}$ | | | | | | | | | 0.03 | | | |
| Bi | mg kg$^{-1}$ | | | | | | | | | | | | |
| Br | mg kg$^{-1}$ | | | | | | | | | | | | |
| Ce | mg kg$^{-1}$ | | | | | 0.0054 | | | | | | | |
| Cl | mg kg$^{-1}$ | | | | | | | | | | | | |
| Co | mg kg$^{-1}$ | | | | | 0.021 | | | | 1.84 | | | |
| Cr | mg kg$^{-1}$ | | | 0.943 | | | | | | | | | |
| Cs | mg kg$^{-1}$ | | | | | | | | | | | | |
| Cu | mg kg$^{-1}$ | 5.1 | | 4.48 | | 3.8 | | 4.5 | 4.7 | | | 4.41 | 4.39 |
| Dy | mg kg$^{-1}$ | | | | | 0.0007 | | | | | | | |
| Er | mg kg$^{-1}$ | | | | | 0.0015 | | | | | | | |
| Eu | mg kg$^{-1}$ | | | | | | | | | | | | |
| Ga | mg kg$^{-1}$ | | | | | 0.138 | | | | 0.04 | | | |
| Gd | mg kg$^{-1}$ | | | | | | | | | | | | |
| Ge | mg kg$^{-1}$ | | | | | | | | | | | | |
| Hf | mg kg$^{-1}$ | | | | | 0.00094 | | | | | | | |
| Ho | mg kg$^{-1}$ | | | | | 0.00025 | | | | | | | |
| In | mg kg$^{-1}$ | | | | | | | | | | | | |
| La | mg kg$^{-1}$ | | | | | 0.0026 | | | | | | | |
| Li | mg kg$^{-1}$ | 0.3 | | | | | | | | 0.14 | | | |
| Lu | mg kg$^{-1}$ | | | | | 0.00015 | | | | | | | |
| Mn | mg kg$^{-1}$ | 0.47 | | 0.237 | | 0.25 | | 0.27 | 0.28 | | | | |
| Mo | mg kg$^{-1}$ | | | | | | | | | | | | |
| Nb | mg kg$^{-1}$ | | | | | 0.0021 | | | | | | | |
| Nd | mg kg$^{-1}$ | | | | | 0.0016 | | | | | | | |
| Ni | mg kg$^{-1}$ | 1 | | 1.22 | | 0.69 | | | | 3.23 | | 1.13 | 1.11 |
| Pb | mg kg$^{-1}$ | 0.03 | | 0.0215 | | 0.022 | | | | | | | |
| Pd | mg kg$^{-1}$ | | | | | | | | | | | | |
| Pr | mg kg$^{-1}$ | | | | | 0.00056 | | | | | | | |
| Rb | mg kg$^{-1}$ | 0.067 | | | | | | | | | | | |
| Re | mg kg$^{-1}$ | | | | | | | | | | | | |
| S | mg kg$^{-1}$ | | | | | 1300 | | | | | | | |
| Sb | mg kg$^{-1}$ | | | | | | | | | | | | |
| Sc | mg kg$^{-1}$ | | | | | | | | | 0.27 | | | |
| Se | mg kg$^{-1}$ | | | | | | | | | | | | |
| Sm | mg kg$^{-1}$ | | | | | | | | | | | | |
| Sn | mg kg$^{-1}$ | | | | | | | | | | | | |
| Sr | mg kg$^{-1}$ | 711 | | 685 | | 651 | | 789.9 | 779.6 | 1558.55 | | 708.2 | 710.1 |
| Ta | mg kg$^{-1}$ | | | | | | | | | | | | |
| Tb | mg kg$^{-1}$ | | | | | | | | | | | | |
| Th | mg kg$^{-1}$ | | | | | 0.00043 | | | | | | | |
| Tl | mg kg$^{-1}$ | | | | | | | | | | | | |
| Tm | mg kg$^{-1}$ | | | | | | | | | | | | |
| U | mg kg$^{-1}$ | 4.05 | | 3.18 | | 2.8 | | 3.24 | 3.28 | 5.38 | | 3.29 | 3.24 |
| V | mg kg$^{-1}$ | 0.174 | | 0.15 | | 0.12 | | 0.13 | 0.14 | | | | |
| W | mg kg$^{-1}$ | | | | | | | | | | | | |
| Y | mg kg$^{-1}$ | | | | | 0.016 | | | | | | | |
| Yb | mg kg$^{-1}$ | | | | | 0.0009 | | | | | | | |
| Zn | mg kg$^{-1}$ | 0.38 | | | | | | | | | | | |
| Zr | mg kg$^{-1}$ | 0.276 | | 0.249 | | 0.25 | | | | 0.46 | | | |

## Table 1 - G-Probe 25b Contributed data for Calcitic speleothem, KCSp-1NP Pellet. 06/10/2021

| Lab Code | | E51A | E51B | - | - | - | - | - | - | - | - | - | - |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SiO2 | $g\ 100g^{-1}$ | 0.668 | | | | | | | | | | | |
| TiO2 | $g\ 100g^{-1}$ | | | | | | | | | | | | |
| Al2O3 | $g\ 100g^{-1}$ | 0.00068 | | | | | | | | | | | |
| Fe2O3T | $g\ 100g^{-1}$ | 0.088 | | | | | | | | | | | |
| MgO | $g\ 100g^{-1}$ | 1.21 | | | | | | | | | | | |
| CaO | $g\ 100g^{-1}$ | 51.18 | | | | | | | | | | | |
| Na2O | $g\ 100g^{-1}$ | 0.05 | | | | | | | | | | | |
| K2O | $g\ 100g^{-1}$ | 0.0017 | | | | | | | | | | | |
| P2O5 | $g\ 100g^{-1}$ | | | | | | | | | | | | |
| Ag | $mg\ kg^{-1}$ | | | | | | | | | | | | |
| As | $mg\ kg^{-1}$ | | | | | | | | | | | | |
| Au | $mg\ kg^{-1}$ | | | | | | | | | | | | |
| B | $mg\ kg^{-1}$ | 5.46 | | | | | | | | | | | |
| Ba | $mg\ kg^{-1}$ | 11.3 | | | | | | | | | | | |
| Be | $mg\ kg^{-1}$ | | | | | | | | | | | | |
| Bi | $mg\ kg^{-1}$ | | | | | | | | | | | | |
| Br | $mg\ kg^{-1}$ | | | | | | | | | | | | |
| Ce | $mg\ kg^{-1}$ | | | | | | | | | | | | |
| Cl | $mg\ kg^{-1}$ | | | | | | | | | | | | |
| Co | $mg\ kg^{-1}$ | 0.17 | | | | | | | | | | | |
| Cr | $mg\ kg^{-1}$ | | | | | | | | | | | | |
| Cs | $mg\ kg^{-1}$ | | | | | | | | | | | | |
| Cu | $mg\ kg^{-1}$ | 4.07 | | | | | | | | | | | |
| Dy | $mg\ kg^{-1}$ | | | | | | | | | | | | |
| Er | $mg\ kg^{-1}$ | | | | | | | | | | | | |
| Eu | $mg\ kg^{-1}$ | | | | | | | | | | | | |
| Ga | $mg\ kg^{-1}$ | | | | | | | | | | | | |
| Gd | $mg\ kg^{-1}$ | | | | | | | | | | | | |
| Ge | $mg\ kg^{-1}$ | | | | | | | | | | | | |
| Hf | $mg\ kg^{-1}$ | | | | | | | | | | | | |
| Ho | $mg\ kg^{-1}$ | | | | | | | | | | | | |
| In | $mg\ kg^{-1}$ | | | | | | | | | | | | |
| La | $mg\ kg^{-1}$ | | | | | | | | | | | | |
| Li | $mg\ kg^{-1}$ | | | | | | | | | | | | |
| Lu | $mg\ kg^{-1}$ | | | | | | | | | | | | |
| Mn | $mg\ kg^{-1}$ | 0.25 | | | | | | | | | | | |
| Mo | $mg\ kg^{-1}$ | | | | | | | | | | | | |
| Nb | $mg\ kg^{-1}$ | | | | | | | | | | | | |
| Nd | $mg\ kg^{-1}$ | | | | | | | | | | | | |
| Ni | $mg\ kg^{-1}$ | 1.13 | | | | | | | | | | | |
| Pb | $mg\ kg^{-1}$ | | | | | | | | | | | | |
| Pd | $mg\ kg^{-1}$ | | | | | | | | | | | | |
| Pr | $mg\ kg^{-1}$ | | | | | | | | | | | | |
| Rb | $mg\ kg^{-1}$ | | | | | | | | | | | | |
| Re | $mg\ kg^{-1}$ | | | | | | | | | | | | |
| S | $mg\ kg^{-1}$ | | | | | | | | | | | | |
| Sb | $mg\ kg^{-1}$ | | | | | | | | | | | | |
| Sc | $mg\ kg^{-1}$ | 0.167 | | | | | | | | | | | |
| Se | $mg\ kg^{-1}$ | | | | | | | | | | | | |
| Sm | $mg\ kg^{-1}$ | | | | | | | | | | | | |
| Sn | $mg\ kg^{-1}$ | | | | | | | | | | | | |
| Sr | $mg\ kg^{-1}$ | 661 | | | | | | | | | | | |
| Ta | $mg\ kg^{-1}$ | | | | | | | | | | | | |
| Tb | $mg\ kg^{-1}$ | | | | | | | | | | | | |
| Th | $mg\ kg^{-1}$ | | | | | | | | | | | | |
| Tl | $mg\ kg^{-1}$ | | | | | | | | | | | | |
| Tm | $mg\ kg^{-1}$ | | | | | | | | | | | | |
| U | $mg\ kg^{-1}$ | 2.98 | | | | | | | | | | | |
| V | $mg\ kg^{-1}$ | 0.124 | | | | | | | | | | | |
| W | $mg\ kg^{-1}$ | | | | | | | | | | | | |
| Y | $mg\ kg^{-1}$ | 0.018 | | | | | | | | | | | |
| Yb | $mg\ kg^{-1}$ | | | | | | | | | | | | |
| Zn | $mg\ kg^{-1}$ | | | | | | | | | | | | |
| Zr | $mg\ kg^{-1}$ | 0.377 | | | | | | | | | | | |

**Table 2 - G-Probe 25b Designated values and statistical summary for Calcitic speleothem, KCSp-1NP Pellet.**

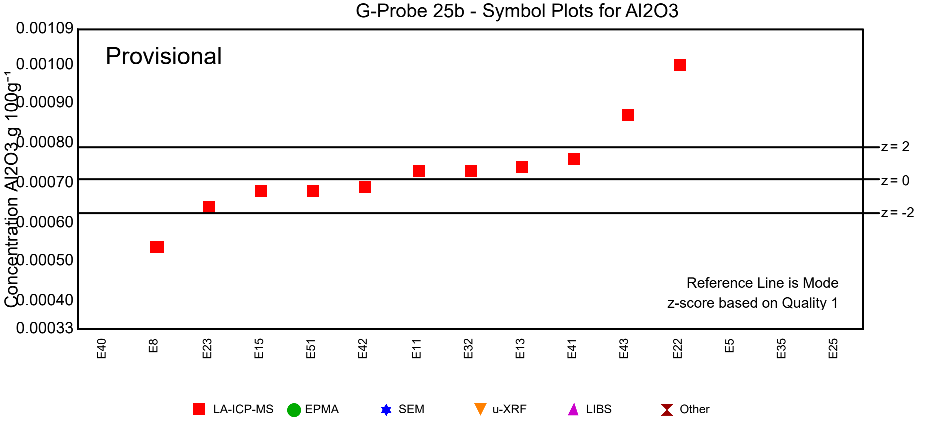
| | Designated Value | Uncertainty of designated value | Horwitz Quality | Horwitz Target Precision | Uncertainty/ Target Precision | Number of reported results | Robust Mean of results | Robust SD of results | Median of results | Status of designated value | Type of designated value |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | $x_{pt}$ | $u(x_{pt})$ | $k \times 0.01$ | $\sigma_{pt}$ | $u(x_{pt}) / \sigma_{pt}$ | $n$ | | | | | |
| | g 100g⁻¹ | g 100g⁻¹ | | g 100g⁻¹ | | | g 100g⁻¹ | g 100g⁻¹ | g 100g⁻¹ | | |
| **Al2O3** | 0.0007086 | 0.0000369 | 1 | 0.00004221 | 0.8741 | 15 | 0.000809 | 0.0002811 | 0.000732 | Provisional | Mode |
| | mg kg⁻¹ | mg kg⁻¹ | | mg kg⁻¹ | | | mg kg⁻¹ | mg kg⁻¹ | mg kg⁻¹ | | |
| **As** | 1.513 | 0.04267 | 1 | 0.1137 | 0.3752 | 9 | 1.513 | 0.128 | 1.54 | Provisional | Robust Mean |
| **Ba** | 12.34 | 0.0902 | 1 | 0.676 | 0.1334 | 23 | 12.82 | 1.174 | 12.5 | Assigned | Mode |
| **Ce** | 0.007823 | 0.001021 | 1 | 0.001298 | 0.7865 | 11 | 0.00804 | 0.002579 | 0.007823 | Provisional | Median |
| **Cu** | 4.695 | 0.09224 | 1 | 0.2975 | 0.31 | 20 | 4.677 | 0.3357 | 4.695 | Assigned | Median |
| **Ga** | 0.024 | 0.00166 | 1 | 0.003365 | 0.4933 | 12 | 0.03058 | 0.01045 | 0.02795 | Provisional | Mode |
| **La** | 0.00354 | 0.00036 | 1 | 0.000662 | 0.5438 | 9 | 0.003882 | 0.00113 | 0.0039 | Provisional | Mode |
| **Li** | 0.135 | 0.00502 | 1 | 0.0146 | 0.3439 | 11 | 0.145 | 0.022 | 0.14 | Provisional | Mode |
| **Mn** | 0.261 | 0.012 | 1 | 0.02555 | 0.4696 | 17 | 0.2628 | 0.02969 | 0.267 | Assigned | Mode |
| **Ni** | 1.09 | 0.0604 | 1 | 0.08606 | 0.7018 | 21 | 1.278 | 0.4373 | 1.13 | Provisional | Mode |
| **Pb** | 0.02 | 0.00169 | 1 | 0.002882 | 0.5864 | 15 | 0.02767 | 0.01185 | 0.022 | Provisional | Mode |
| **Sr** | 717.7 | 10.49 | 1 | 21.34 | 0.4915 | 24 | 717.7 | 51.38 | 720.6 | Assigned | Robust Mean |
| **U** | 3.32 | 0.0442 | 1 | 0.2217 | 0.1994 | 23 | 3.405 | 0.3153 | 3.415 | Assigned | Mode |
| **V** | 0.151 | 0.005068 | 1 | 0.01605 | 0.3157 | 21 | 0.1541 | 0.02165 | 0.151 | Assigned | Median |
| **Y** | 0.016 | 0.0009013 | 1 | 0.002385 | 0.378 | 17 | 0.01716 | 0.003665 | 0.016 | Assigned | Median |
| **Zr** | 0.2435 | 0.00379 | 1 | 0.02409 | 0.1573 | 21 | 0.2533 | 0.02294 | 0.249 | Assigned | Mode |

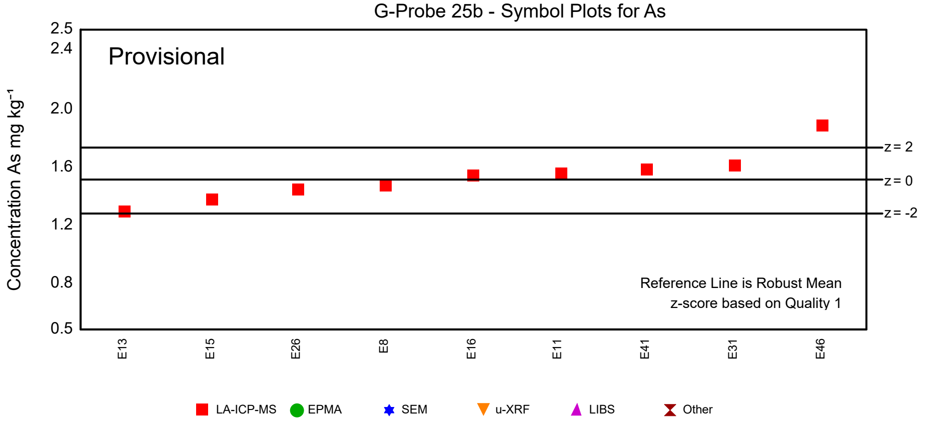
**Table 3 - G-Probe 25b Z-scores for Calcitic speleothem, KCSp-1NP Pellet. 06/10/2021**

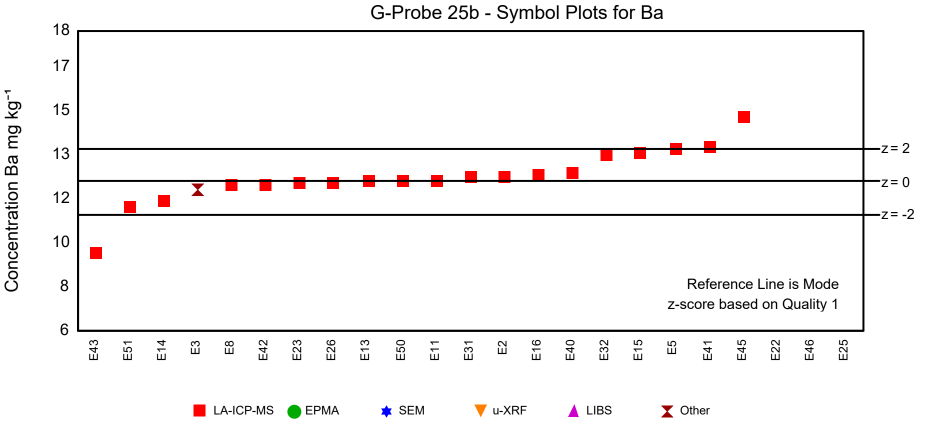
| Lab Code | E2 | E3 | E5 | E8 | E11 | E13 | E14 | E15 | E16 | E22 | E23 | E24 | E25 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Al2O3: 1** | * | * | _17.56_ | _-4.09_ | _0.49_ | _0.74_ | * | _-0.68_ | * | _6.90_ | _-1.63_ | * | _220.11_ |
| **As: 1** | * | * | * | _-0.38_ | _0.37_ | _-1.88_ | * | _-1.18_ | _0.23_ | * | * | * | * |
| **Ba: 1** | 0.32 | -0.50 | 1.97 | -0.20 | 0.07 | -0.02 | -1.16 | 1.72 | 0.39 | 14.80 | -0.11 | * | 30.13 |
| **Ce: 1** | _1.68_ | _0.14_ | * | _-1.45_ | _0.00_ | * | * | _-1.36_ | _-1.10_ | _109.50_ | _-1.40_ | * | _155.71_ |
| **Cu: 1** | 1.06 | 0.82 | 0.24 | -0.71 | -0.48 | -4.22 | -0.39 | 0.88 | 0.12 | * | * | * | 28.58 |
| **Ga: 1** | _-1.19_ | * | * | _-0.98_ | _-0.33_ | * | * | _1.16_ | _1.19_ | _4.16_ | _-0.30_ | * | _361.36_ |
| **La: 1** | * | _0.69_ | * | _-0.79_ | _-0.70_ | * | * | _-0.42_ | _0.54_ | _2.96_ | * | * | _236.33_ |
| **Li: 1** | * | * | * | _-1.19_ | _-0.12_ | * | * | _-0.31_ | _-0.34_ | _4.11_ | * | * | * |
| **Mn: 1** | -0.43 | * | * | -0.80 | 1.16 | 0.35 | -0.55 | 0.51 | -1.60 | * | 0.23 | * | -10.18 |
| **Ni: 1** | _-1.74_ | _2.21_ | _9.82_ | _-2.04_ | _-1.07_ | _-0.58_ | _1.01_ | * | _3.60_ | _8.97_ | _1.44_ | * | _67.40_ |
| **Pb: 1** | _0.00_ | _12.14_ | _2.43_ | _-1.04_ | _0.26_ | _5.55_ | * | _-0.45_ | * | _3.99_ | * | * | _79.80_ |
| **Sr: 1** | 1.53 | -3.60 | 0.95 | -2.89 | -1.12 | 0.29 | -2.66 | 1.01 | 0.20 | 23.81 | 0.10 | -1.56 | 852.13 |
| **U: 1** | 1.13 | 0.45 | 0.63 | -1.19 | -0.56 | 0.36 | -1.03 | 0.53 | 1.31 | 14.49 | 0.43 | * | 19.35 |
| **V: 1** | 0.56 | 0.62 | 7.41 | -1.28 | -0.22 | -1.12 | -0.06 | 0.78 | 0.56 | 9.16 | 0.00 | * | 228.56 |
| **Y: 1** | 1.68 | 0.42 | * | -0.24 | 2.74 | -1.26 | 0.84 | 1.28 | 0.00 | 5.24 | 0.00 | * | 186.20 |
| **Zr: 1** | 0.68 | 0.10 | -0.10 | -0.56 | 0.06 | -0.15 | -0.48 | 0.89 | 0.27 | 7.29 | -0.44 | * | 34.72 |

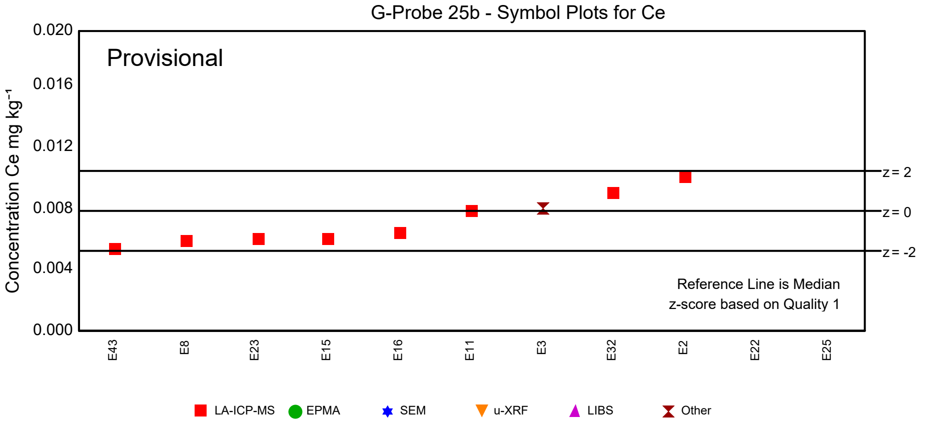
**Table 3 - G-Probe 25b Z-scores for Calcitic speleothem, KCSp-1NP Pellet. 06/10/2021**

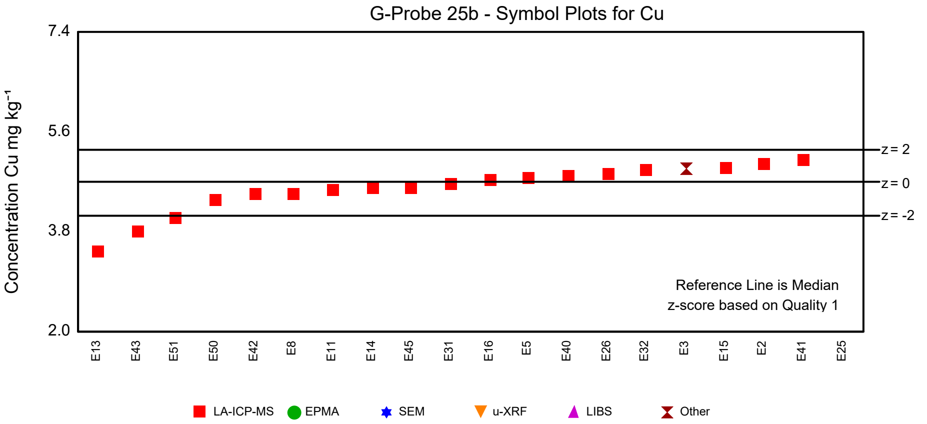
| Lab Code | E26 | E31 | E32 | E35 | E40 | E41 | E42 | E43 | E45 | E46 | E50 | E51 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Al2O3: 1** | * | * | *0.55* | *220.11* | *-15.53* | *1.22* | *-0.49* | *3.82* | * | * | * | *-0.68* |
| **As: 1** | *-0.56* | *0.85* | * | * | * | *0.67* | * | * | * | *3.22* | * | * |
| **Ba: 1** | -0.07 | 0.24 | 1.58 | * | 0.56 | 2.02 | -0.20 | -4.25 | 3.91 | 22.51 | 0.02 | -1.53 |
| **Ce: 1** | * | * | *0.91* | * | * | * | * | *-1.87* | * | * | * | * |
| **Cu: 1** | 0.49 | -0.12 | 0.77 | * | 0.40 | 1.36 | -0.72 | -3.01 | -0.32 | * | -0.99 | -2.10 |
| **Ga: 1** | *1.78* | *0.00* | * | * | * | * | * | *33.88* | * | *4.75* | * | * |
| **La: 1** | * | * | *0.69* | * | * | * | * | *-1.42* | * | * | * | * |
| **Li: 1** | *0.00* | *2.19* | *0.34* | * | *0.75* | *11.30* | * | * | * | *0.34* | * | * |
| **Mn: 1** | * | * | 1.13 | 2729.23 | 0.48 | 8.18 | -0.94 | -0.43 | 0.55 | * | * | -0.43 |
| **Ni: 1** | *0.00* | *-0.81* | *-1.05* | *870.45* | * | *-1.05* | *1.51* | *-4.65* | * | *24.87* | *0.35* | *0.46* |
| **Pb: 1** | * | *14.57* | *-0.35* | * | *-1.64* | *3.47* | *0.52* | *0.69* | * | * | * | * |
| **Sr: 1** | -0.68 | 1.42 | 0.90 | * | 0.17 | -0.32 | -1.53 | -3.13 | 3.14 | 39.41 | -0.40 | -2.66 |
| **U: 1** | 0.92 | 0.45 | -0.45 | * | 0.23 | 3.29 | -0.63 | -2.35 | -0.27 | 9.29 | -0.25 | -1.53 |
| **V: 1** | 1.18 | -0.19 | -0.62 | * | 0.35 | 1.43 | -0.06 | -1.93 | -1.00 | * | * | -1.68 |
| **Y: 1** | -2.52 | -0.84 | -0.42 | * | -0.54 | * | * | 0.00 | * | * | * | 0.84 |
| **Zr: 1** | 0.27 | -0.73 | -0.06 | * | -0.40 | 1.35 | 0.23 | 0.27 | * | 8.99 | * | 5.54 |

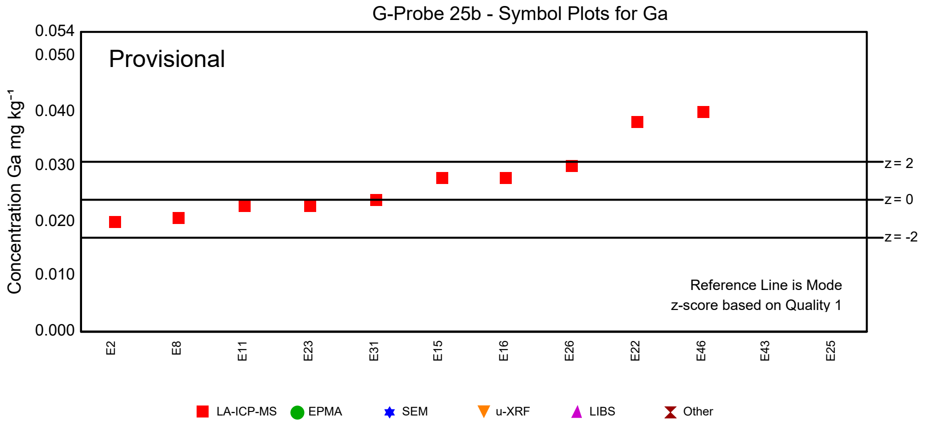

G-Probe 25b - Symbol Plots for Al2O3
Provisional
Concentration Al2O3 g 100g⁻¹
Reference Line is Mode
z-score based on Quality 1
z= 2
z= 0
z= -2
E40 E8 E23 E15 E51 E42 E11 E32 E13 E41 E43 E22 E5 E35 E25
LA-ICP-MS EPMA SEM u-XRF LIBS Other

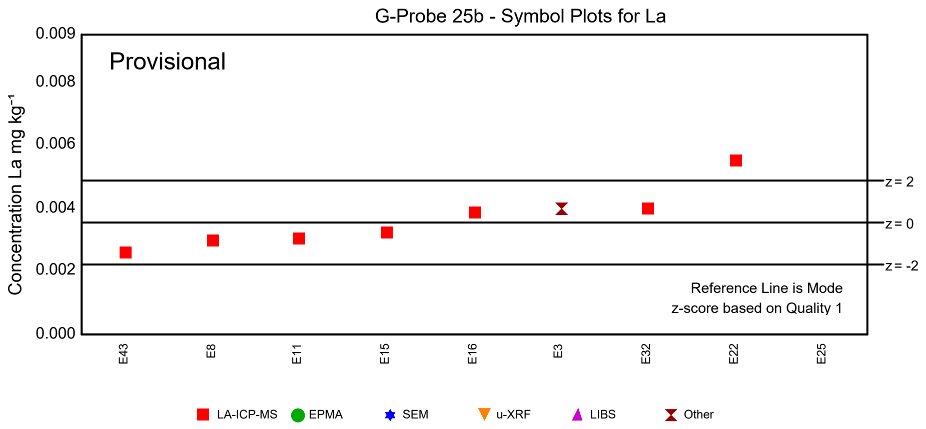

G-Probe 25b - Symbol Plots for As
Provisional
Concentration As mg kg⁻¹
Reference Line is Robust Mean
z-score based on Quality 1
z= 2
z= 0
z= -2
E13 E15 E26 E8 E16 E11 E41 E31 E46
LA-ICP-MS EPMA SEM u-XRF LIBS Other

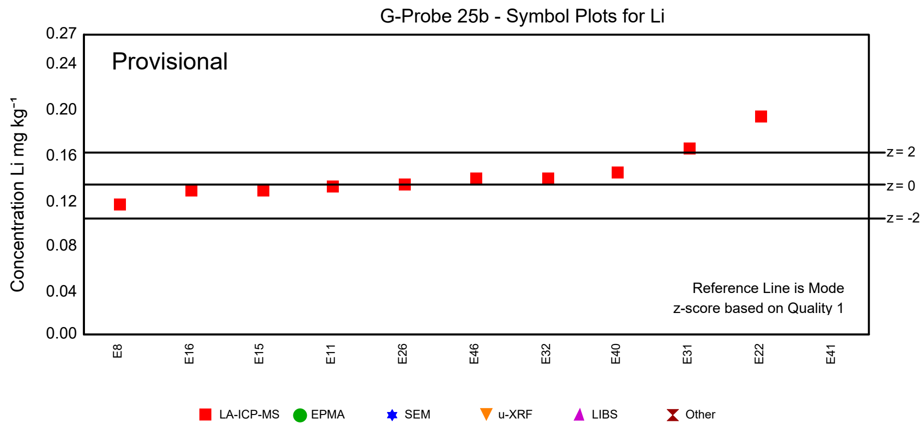

G-Probe 25b - Symbol Plots for Ba
Concentration Ba mg kg⁻¹
Reference Line is Mode
z-score based on Quality 1
z= 2
z= 0
z= -2
E43 E51 E14 E3 E8 E42 E23 E26 E13 E50 E11 E31 E2 E16 E40 E32 E15 E5 E41 E45 E22 E46 E25
LA-ICP-MS EPMA SEM u-XRF LIBS Other

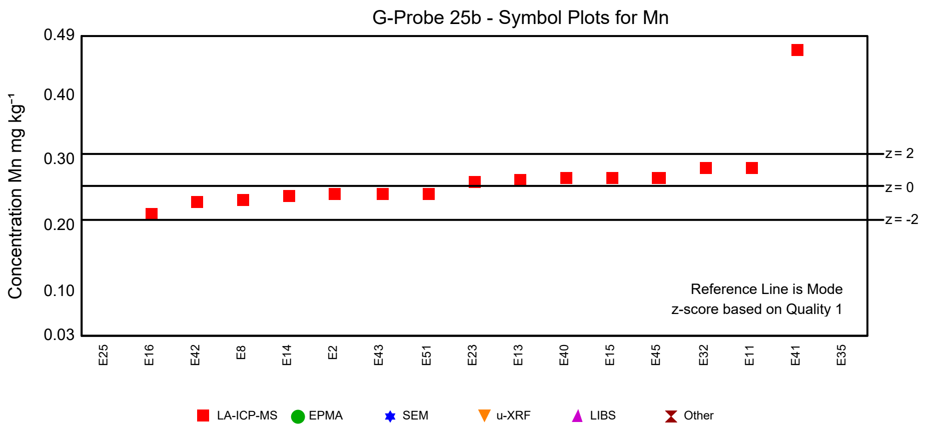

G-Probe 25b - Symbol Plots for Ce
Provisional
Concentration Ce mg kg⁻¹
Reference Line is Median
z-score based on Quality 1
z= 2
z= 0
z= -2
E43 E8 E23 E15 E16 E11 E3 E32 E2 E22 E25
LA-ICP-MS EPMA SEM u-XRF LIBS Other

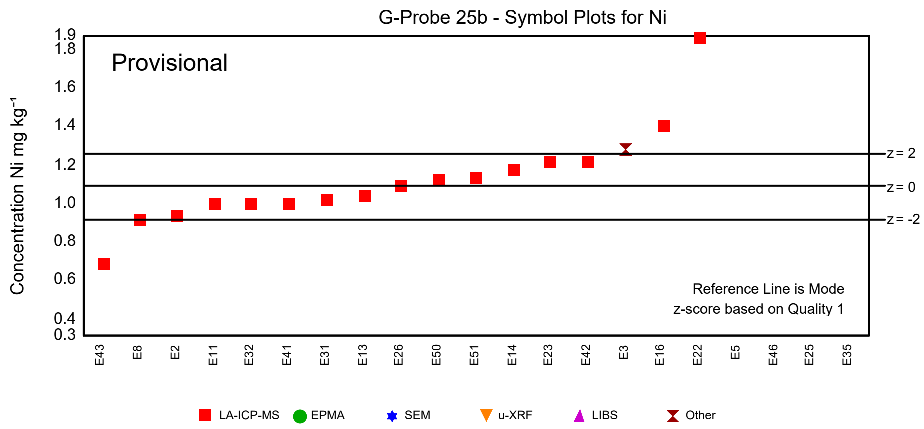

G-Probe 25b - Symbol Plots for Cu
Concentration Cu mg kg⁻¹
Reference Line is Median
z-score based on Quality 1
z= 2
z= 0
z= -2
E13 E43 E51 E50 E42 E8 E11 E14 E45 E31 E16 E5 E40 E26 E32 E3 E15 E2 E41 E25
LA-ICP-MS EPMA SEM u-XRF LIBS Other

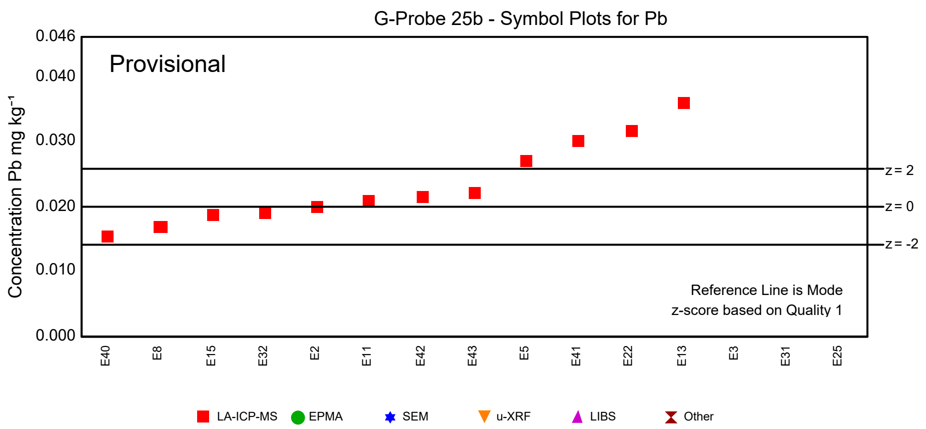

G-Probe 25b - Symbol Plots for Ga
Provisional
Concentration Ga mg kg⁻¹
Reference Line is Mode
z-score based on Quality 1
z= 2
z= 0
z= -2
E2 E8 E11 E23 E31 E15 E16 E26 E22 E46 E43 E25
LA-ICP-MS EPMA SEM u-XRF LIBS Other

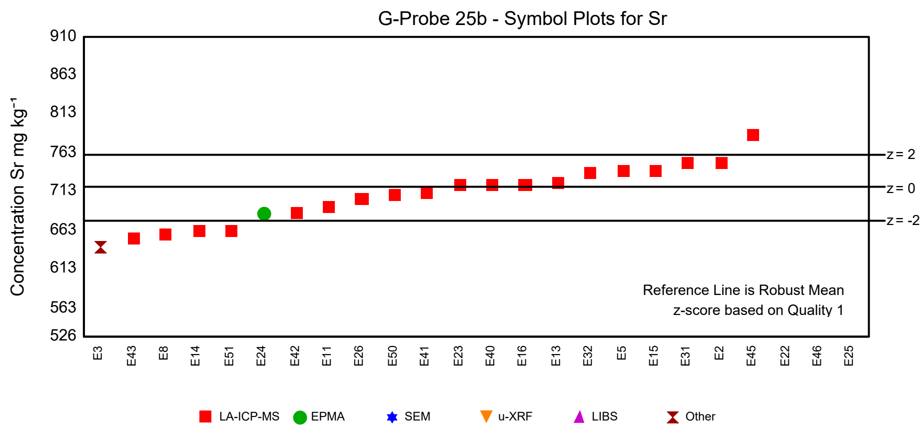

G-Probe 25b - Symbol Plots for La
Provisional
Concentration La mg kg⁻¹
z= 2
z= 0
z= -2
Reference Line is Mode
z-score based on Quality 1
E43 E8 E11 E15 E16 E3 E32 E22 E25
LA-ICP-MS EPMA SEM u-XRF LIBS Other


G-Probe 25b - Symbol Plots for Li
Provisional
Concentration Li mg kg⁻¹
z= 2
z= 0
z= -2
Reference Line is Mode
z-score based on Quality 1
E8 E16 E15 E11 E26 E46 E32 E40 E31 E22 E41
LA-ICP-MS EPMA SEM u-XRF LIBS Other


G-Probe 25b - Symbol Plots for Mn
Concentration Mn mg kg⁻¹
z= 2
z= 0
z= -2
Reference Line is Mode
z-score based on Quality 1
E25 E16 E42 E8 E14 E2 E43 E51 E23 E13 E40 E15 E45 E32 E11 E41 E35
LA-ICP-MS EPMA SEM u-XRF LIBS Other


G-Probe 25b - Symbol Plots for Ni
Provisional
Concentration Ni mg kg⁻¹
z= 2
z= 0
z= -2
Reference Line is Mode
z-score based on Quality 1
E43 E8 E2 E11 E32 E41 E31 E13 E26 E50 E51 E14 E23 E42 E3 E16 E22 E5 E46 E25 E35
LA-ICP-MS EPMA SEM u-XRF LIBS Other


G-Probe 25b - Symbol Plots for Pb
Provisional
Concentration Pb mg kg⁻¹
z= 2
z= 0
z= -2
Reference Line is Mode
z-score based on Quality 1
E40 E8 E15 E32 E2 E11 E42 E43 E5 E41 E22 E13 E3 E31 E25
LA-ICP-MS EPMA SEM u-XRF LIBS Other


G-Probe 25b - Symbol Plots for Sr
Concentration Sr mg kg⁻¹
z= 2
z= 0
z= -2
Reference Line is Robust Mean
z-score based on Quality 1
E3 E43 E8 E14 E51 E24 E42 E11 E26 E50 E41 E23 E40 E16 E13 E32 E5 E15 E31 E2 E45 E22 E46 E25
LA-ICP-MS EPMA SEM u-XRF LIBS Other

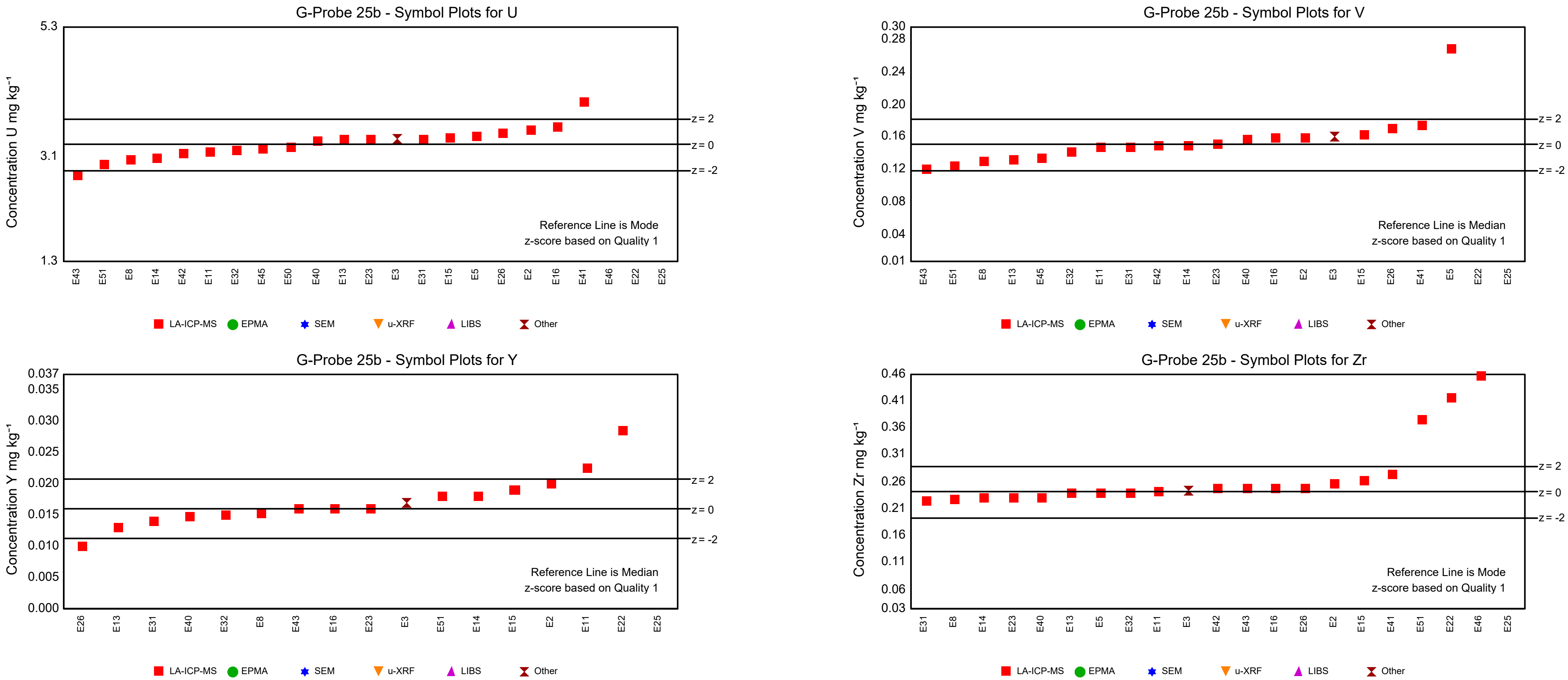
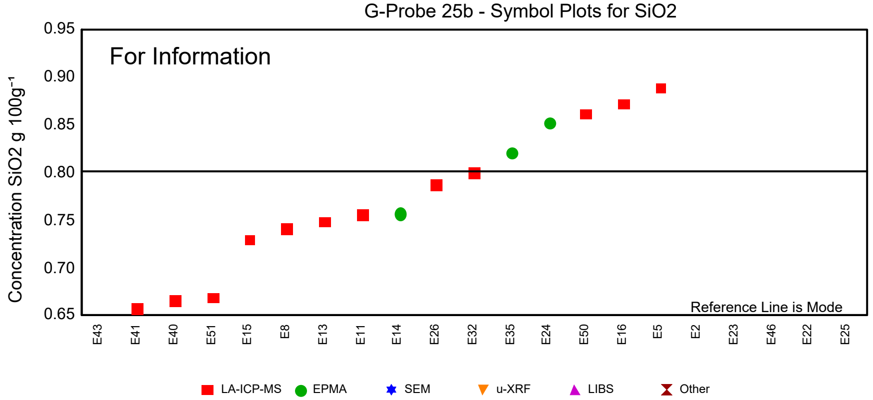
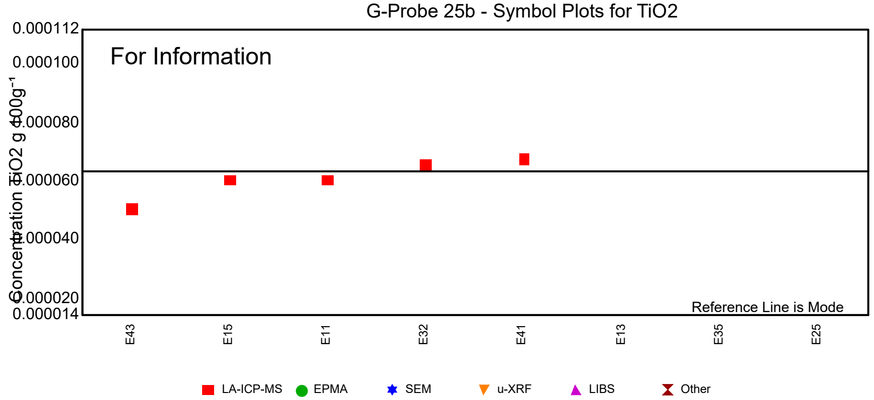
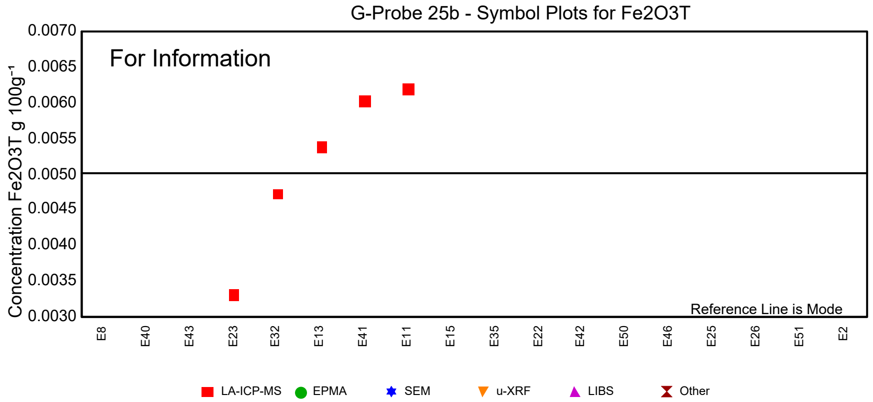
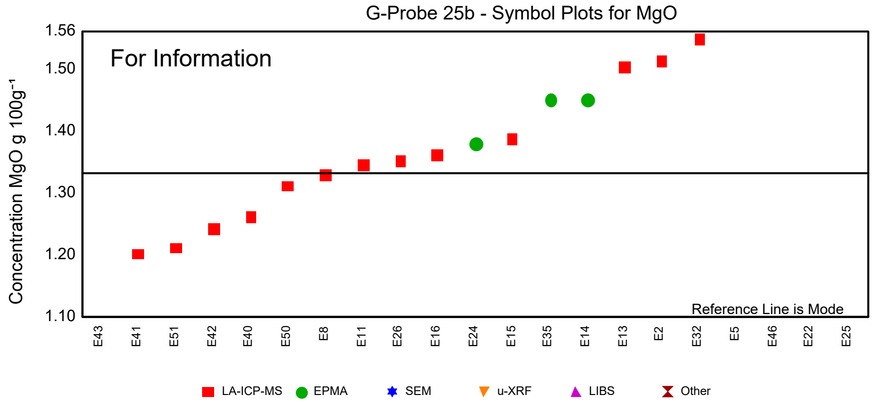


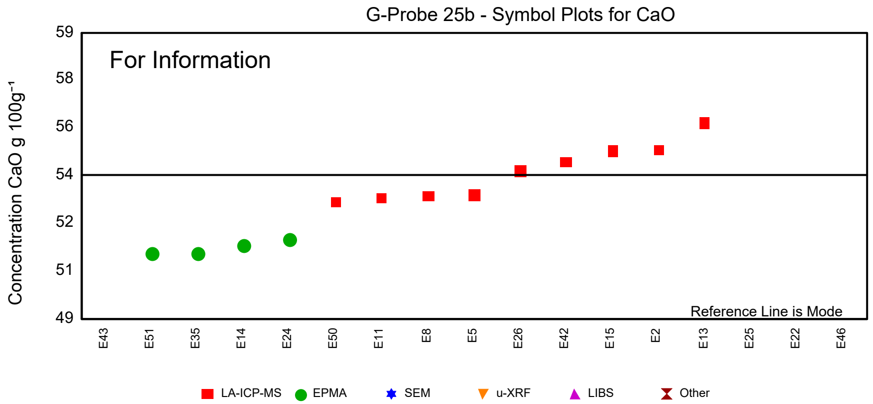

Figure 1: G-Probe 25b - Calcitic speleothem, KCSp-1NP Pellet. Data distribution charts for elements for which values were assigned or provisional values given for guidance. Horizontal lines show the limits for -2<z<2 where the z-score is derived according to the Quality specified.

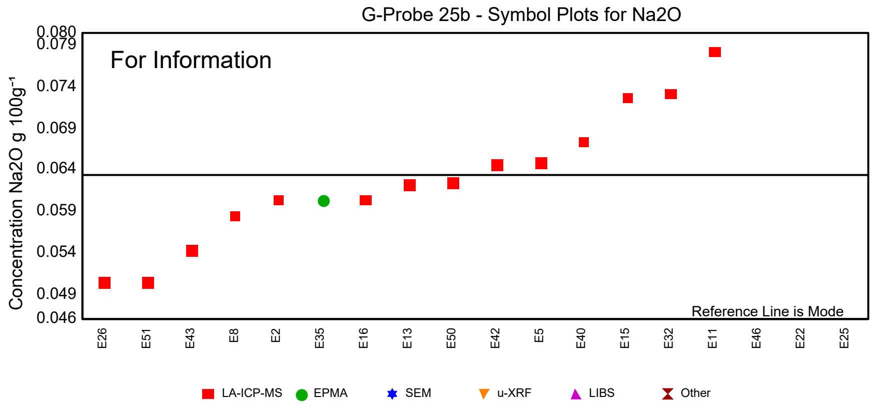

G-Probe 25b - Symbol Plots for SiO2
For Information
Concentration SiO2 g 100g⁻¹
Reference Line is Mode
LA-ICP-MS
EPMA
SEM
u-XRF
LIBS
Other

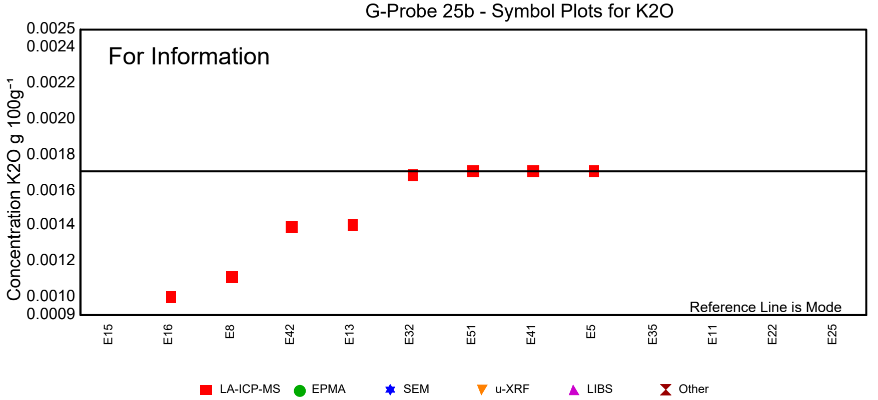

G-Probe 25b - Symbol Plots for TiO2
For Information
Concentration TiO2 g 100g⁻¹
Reference Line is Mode
LA-ICP-MS
EPMA
SEM
u-XRF
LIBS
Other

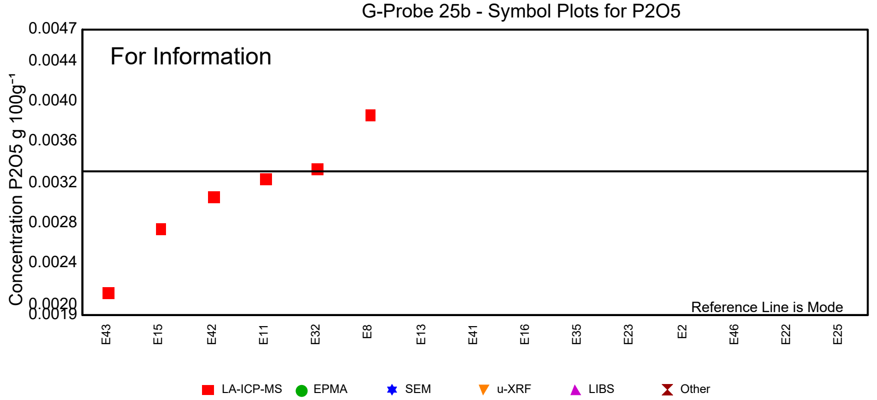

G-Probe 25b - Symbol Plots for Fe2O3T
For Information
Concentration Fe2O3T g 100g⁻¹
Reference Line is Mode
LA-ICP-MS
EPMA
SEM
u-XRF
LIBS
Other

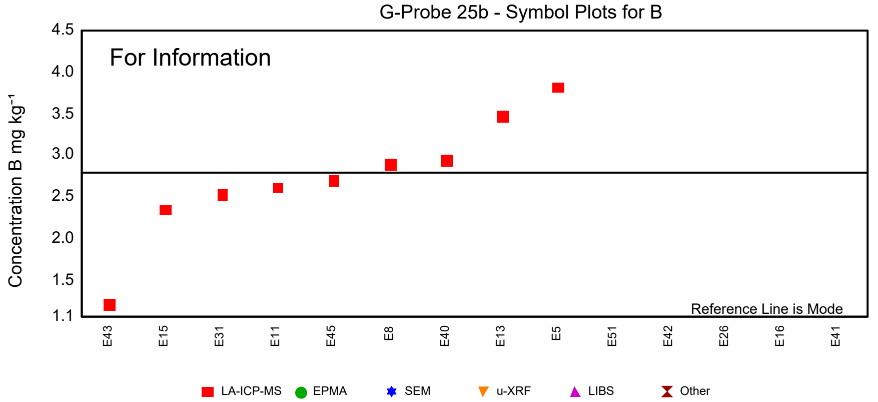

G-Probe 25b - Symbol Plots for MgO
For Information
Concentration MgO g 100g⁻¹
Reference Line is Mode
LA-ICP-MS
EPMA
SEM
u-XRF
LIBS
Other

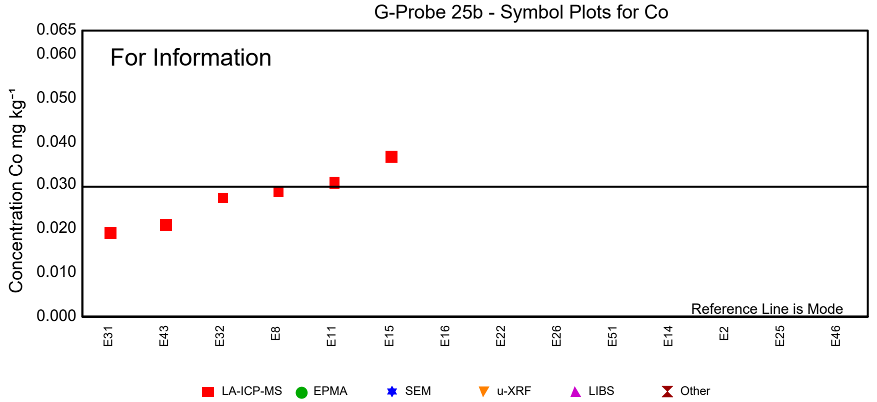

G-Probe 25b - Symbol Plots for CaO
For Information
Concentration CaO g 100g⁻¹
Reference Line is Mode
LA-ICP-MS
EPMA
SEM
u-XRF
LIBS
Other

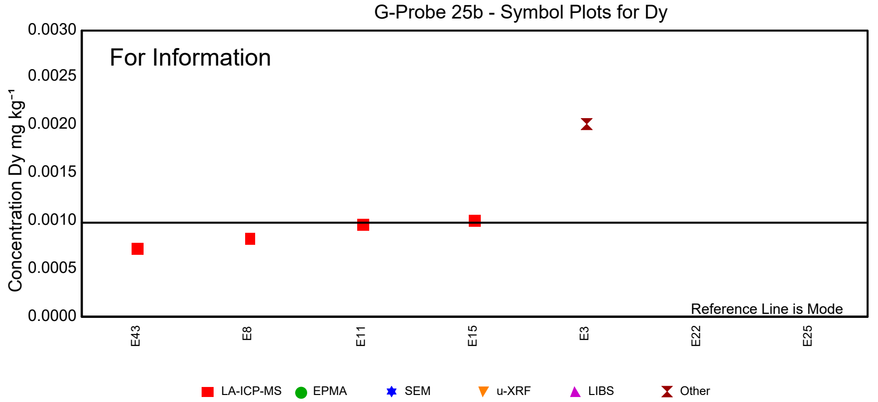

G-Probe 25b - Symbol Plots for Na2O
For Information
Concentration Na2O g 100g⁻¹
Reference Line is Mode
LA-ICP-MS
EPMA
SEM
u-XRF
LIBS
Other

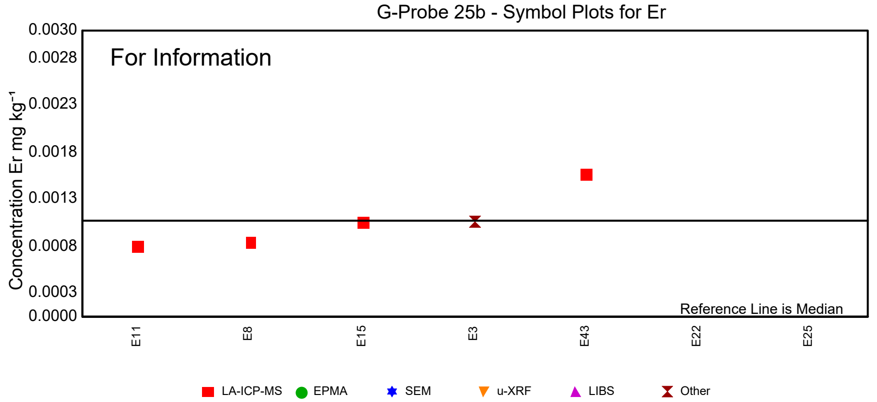

G-Probe 25b - Symbol Plots for K2O
For Information
Concentration K2O g 100g⁻¹
Reference Line is Mode
E15 E16 E8 E42 E13 E32 E51 E41 E5 E35 E11 E22 E25
LA-ICP-MS EPMA SEM u-XRF LIBS Other

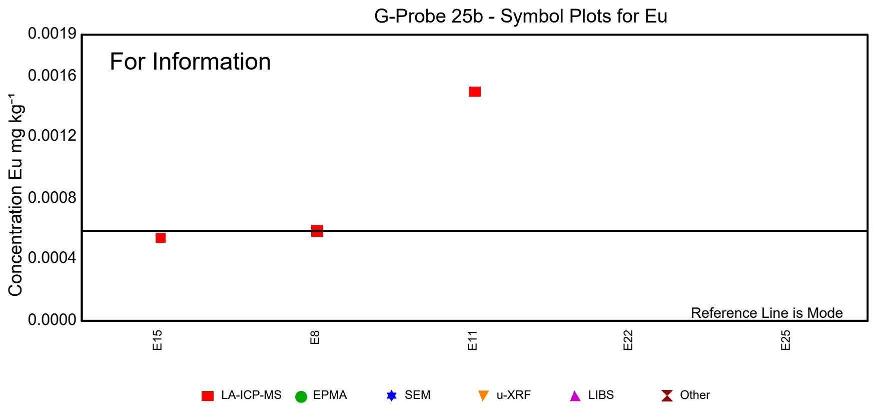

G-Probe 25b - Symbol Plots for P2O5
For Information
Concentration P2O5 g 100g⁻¹
Reference Line is Mode
E43 E15 E42 E11 E32 E8 E13 E41 E16 E35 E23 E2 E46 E22 E25
LA-ICP-MS EPMA SEM u-XRF LIBS Other


G-Probe 25b - Symbol Plots for B
For Information
Concentration B mg kg⁻¹
Reference Line is Mode
E43 E15 E31 E11 E45 E8 E40 E13 E5 E51 E42 E26 E16 E41
LA-ICP-MS EPMA SEM u-XRF LIBS Other

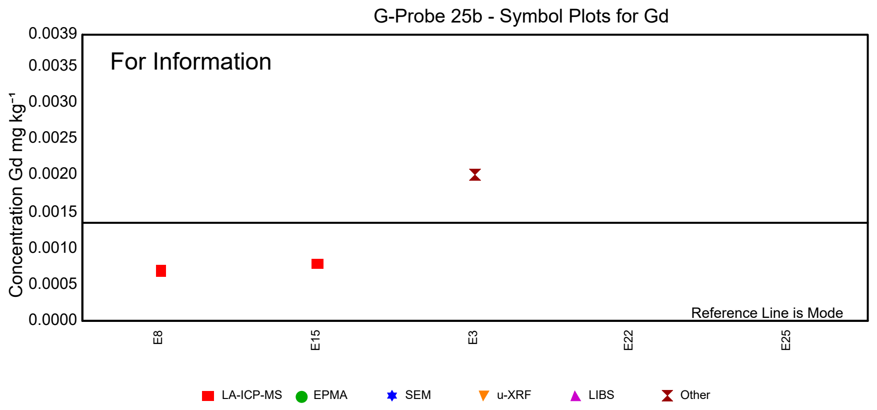

G-Probe 25b - Symbol Plots for Co
For Information
Concentration Co mg kg⁻¹
Reference Line is Mode
E31 E43 E32 E8 E11 E15 E16 E22 E26 E51 E14 E2 E25 E46
LA-ICP-MS EPMA SEM u-XRF LIBS Other


G-Probe 25b - Symbol Plots for Dy
For Information
Concentration Dy mg kg⁻¹
Reference Line is Mode
E43 E8 E11 E15 E3 E22 E25
LA-ICP-MS EPMA SEM u-XRF LIBS Other

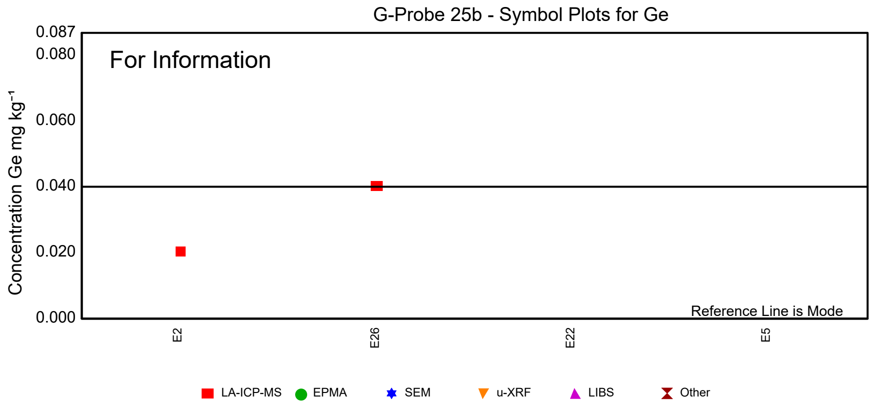

G-Probe 25b - Symbol Plots for Er
For Information
Concentration Er mg kg⁻¹
Reference Line is Median
E11 E8 E15 E3 E43 E22 E25
LA-ICP-MS EPMA SEM u-XRF LIBS Other



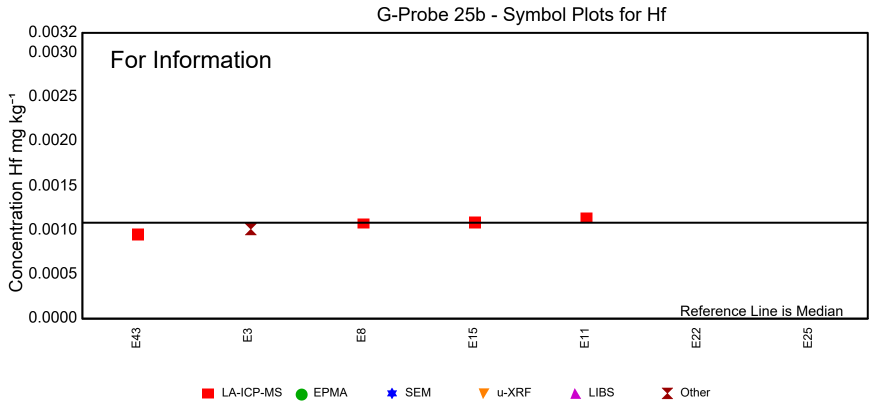
G-Probe 25b - Symbol Plots for Eu
For Information
Concentration Eu mg kg⁻¹
Reference Line is Mode
E15
E8
E11
E22
E25
LA-ICP-MS
EPMA
SEM
u-XRF
LIBS
Other

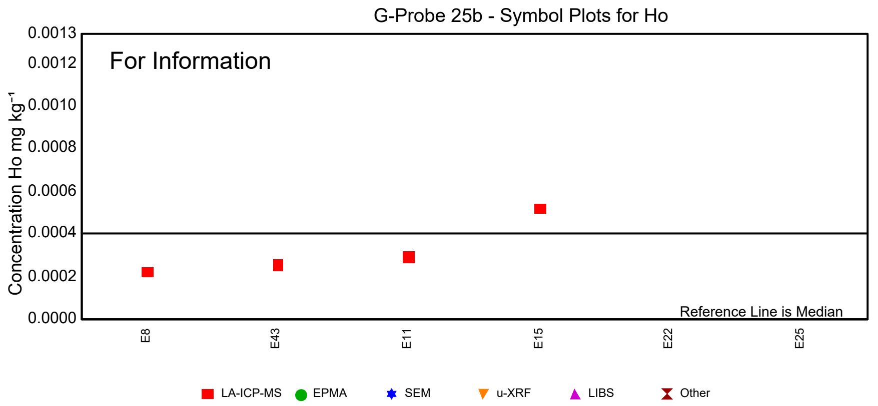
G-Probe 25b - Symbol Plots for Gd
For Information
Concentration Gd mg kg⁻¹
Reference Line is Mode
E8
E15
E3
E22
E25
LA-ICP-MS
EPMA
SEM
u-XRF
LIBS
Other

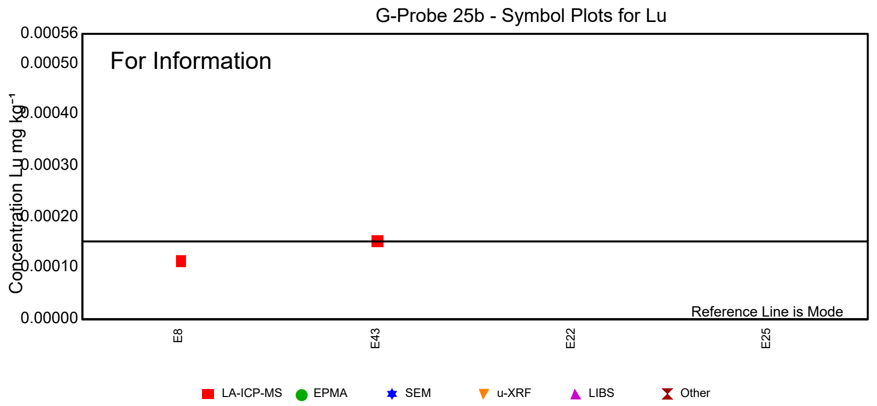
G-Probe 25b - Symbol Plots for Ge
For Information
Concentration Ge mg kg⁻¹
Reference Line is Mode
E2
E26
E22
E5
LA-ICP-MS
EPMA
SEM
u-XRF
LIBS
Other

G-Probe 25b - Symbol Plots for Hf
For Information
Concentration Hf mg kg⁻¹
Reference Line is Median
E43
E3
E8
E15
E11
E22
E25
LA-ICP-MS
EPMA
SEM
u-XRF
LIBS
Other

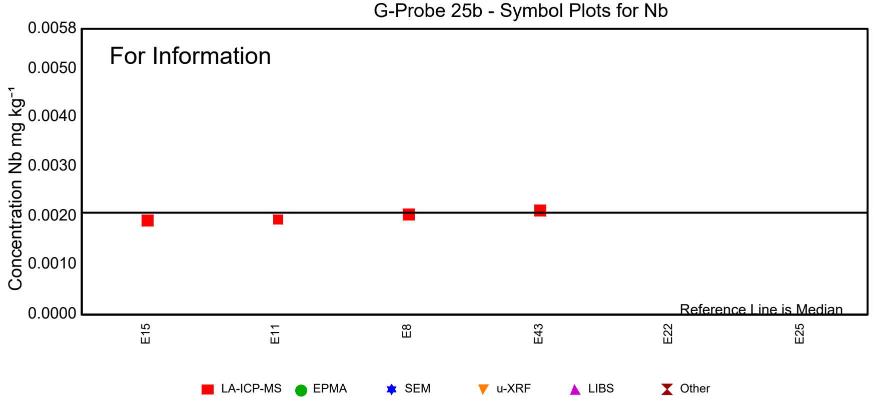



G-Probe 25b - Symbol Plots for Ho
For Information
Concentration Ho mg kg⁻¹
Reference Line is Median
E8
E43
E11
E15
E22
E25
LA-ICP-MS
EPMA
SEM
u-XRF
LIBS
Other

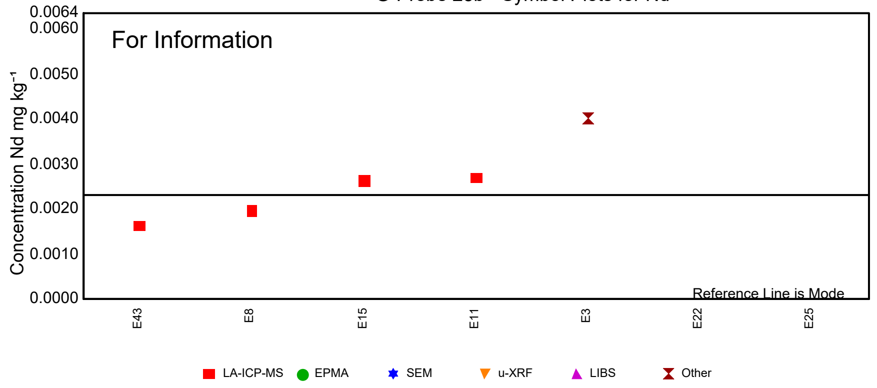



G-Probe 25b - Symbol Plots for Lu
For Information
Concentration Lu mg kg⁻¹
Reference Line is Mode
E8
E43
E22
E25
LA-ICP-MS
EPMA
SEM
u-XRF
LIBS
Other

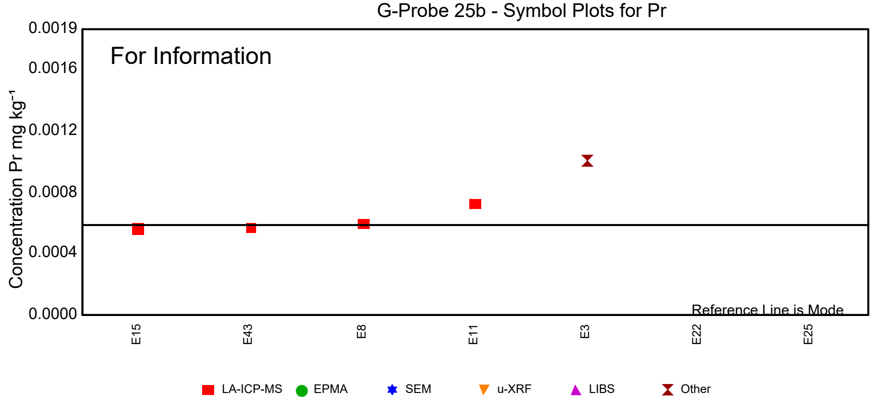
G-Probe 25b - Symbol Plots for Nb



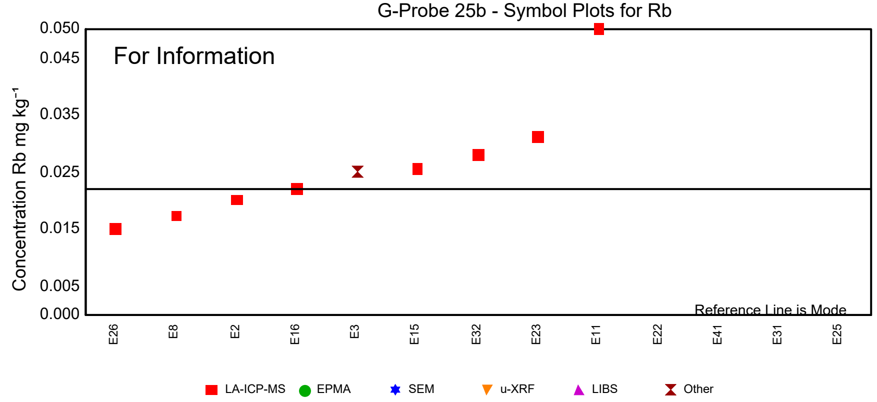

G-Probe 25b - Symbol Plots for Nd



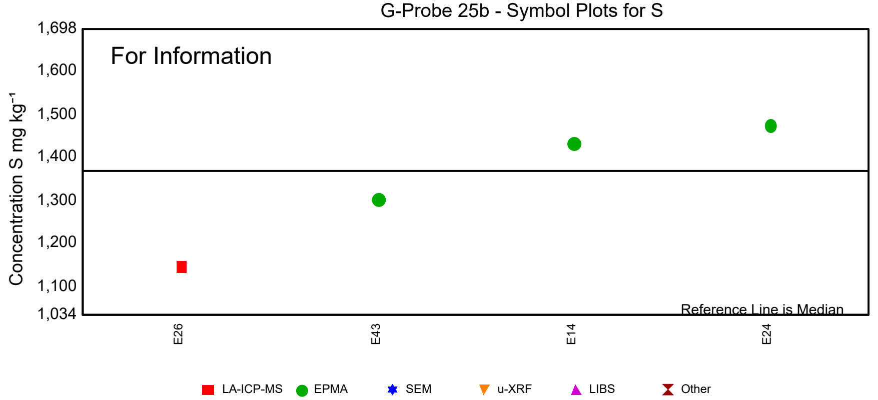

G-Probe 25b - Symbol Plots for Pr



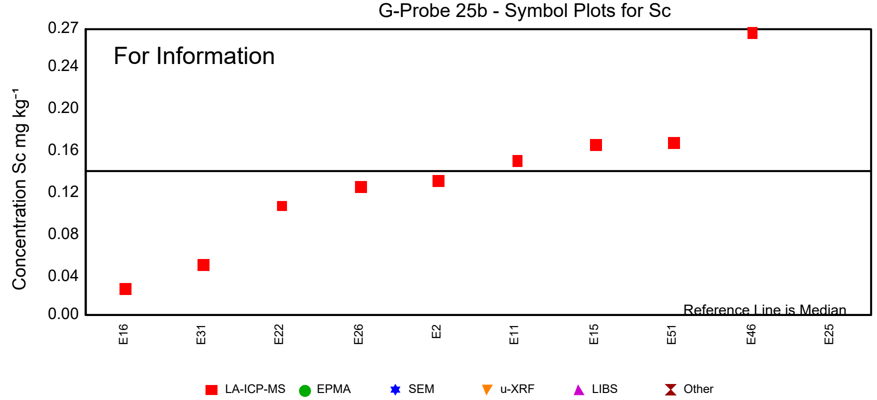

G-Probe 25b - Symbol Plots for Rb

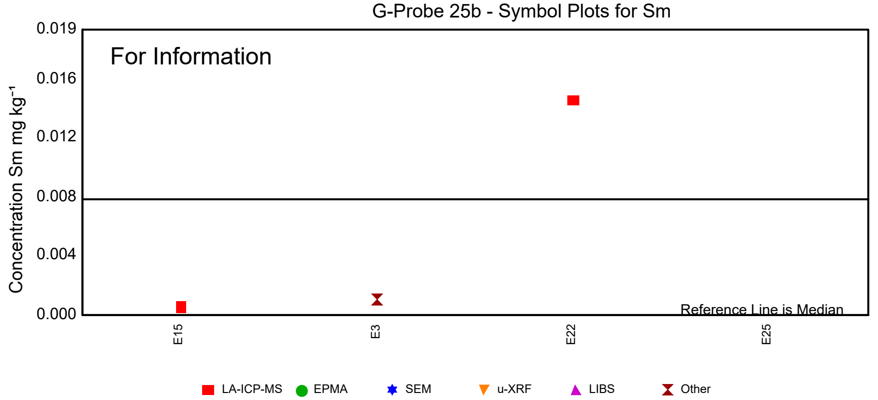


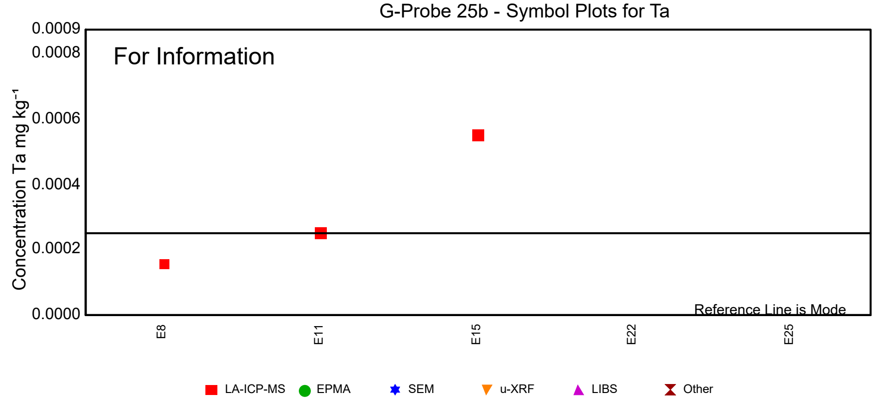

G-Probe 25b - Symbol Plots for S

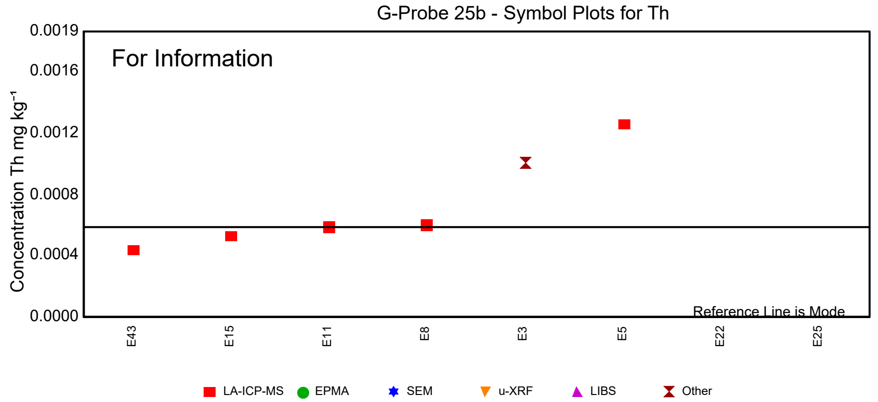


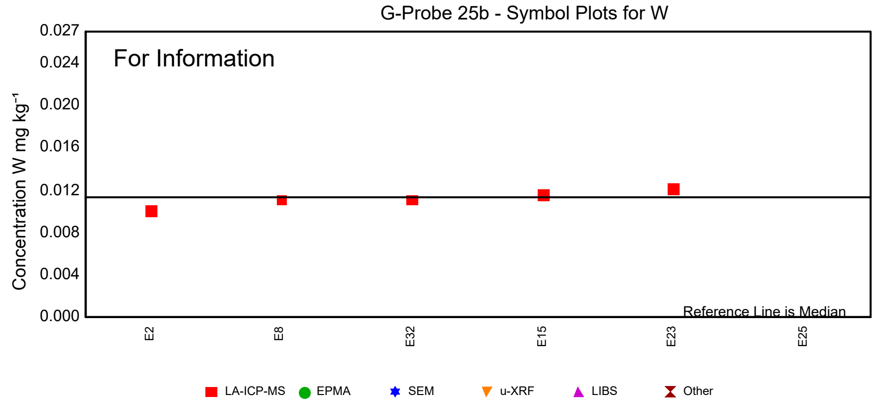

G-Probe 25b - Symbol Plots for Sc

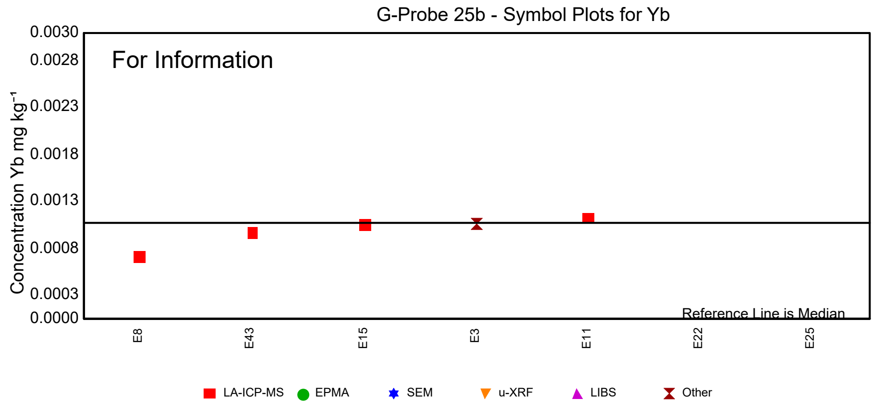




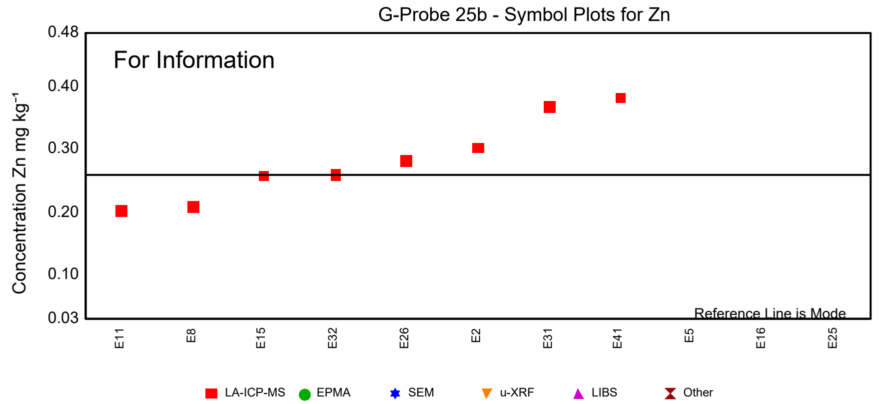




Figure 2: G-Probe 25b - Calcitic speleothem, KCSp-1NP Pellet. Data distribution charts provided for information only for elements for which values could not be credited with assigned or provisional status.

## Multiple Z-Score Chart for G-Probe 25b

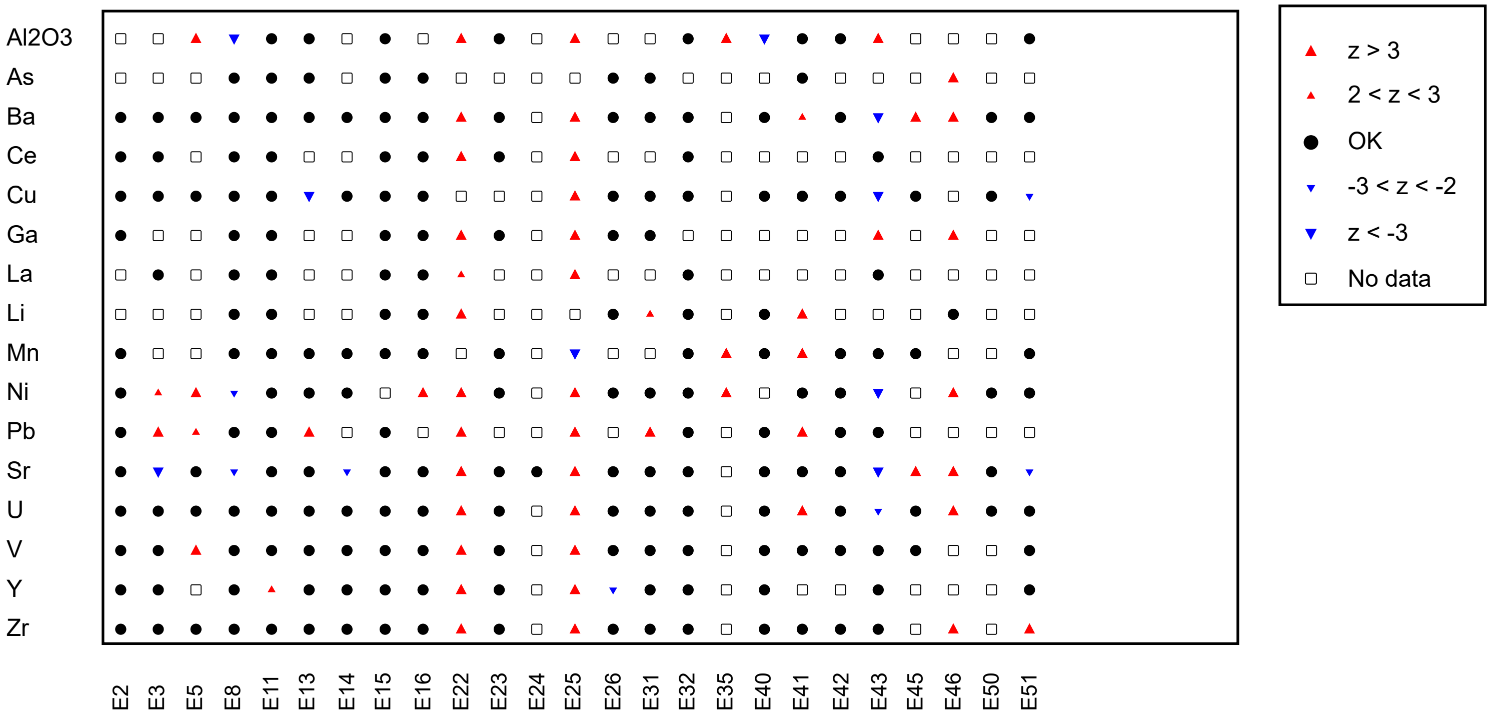



Figure 3: G-Probe 25b - Calcitic speleothem, KCSp-1NP Pellet. Multiple z-score charts for laboratories participating in the G-Probe 25b round. Symbols indicate whether or not an elemental result complies with the -2<z<+2 criteria (see key).