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REPORT No. 26

INTERCALIBRATION OF ANALYTICAL METHODS ON MARINE ENVIRONMENTAL SAMPLES

Trace Element Measurements on Mussel Homogenate

(MA-M-2/TM)

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Laboratory of Marine Radioactivity

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1. Introduction

It is well known today that mollusca are able to concentrate micropollutants (e.g. heavy metals) in their tissues from the surrounding sea-water. When animals of the same species are living in the same conditions, the average concentration of a heavy metal determined in their tissues after a sufficiently long exposure time should reflect the mean concentration of this metal in their environment (or at least that of its biologically available forms). On the other hand, heavy metals are normally present in sea-water at very low concentration levels and it is much easier and less expensive to determine them in biological tissues than directly in sea-water. Mussels, in particular, have been considered as good indicators of heavy metal pollution of the marine environment and this led to the development of mussel watch programmes in many countries in the late seventies (1).

The present intercomparison had a double aim: first, it was intended to give to laboratories dealing with heavy metal analyses of mussel tissues an opportunity for checking their analytical performance. Then, it was judged highly suitable for these laboratories to have at their disposal a reference material made of mussel tissue which would be accurately certified with respect to many trace elements. Such a material would allow chemists to check the validity of new analytical procedures.

2. Scope of the intercomparison

Each participating laboratory received a sample accompanied by an information sheet and a report form. Participants were requested to determine

as many as they could from among the following 15 elements: Ag, As, Cd, Co, Cr, Cu, Fe, Hg, Mn, Ni, Pb, Sb, Se, V and Zn. The IAEA, however, expressed its interest in receiving results for any other element(s) which participating laboratories would be willing to determine.

In total, 55 laboratories from 29 countries submitted 529 laboratory means on 46 elements. 19 of these results were reported as "less than" and could not be used in the final data treatment. They were, however, registered in the tables. For 16 elements only isolated results (1 or 2 laboratory means) were supplied.

3. Description of the material

About 600 Kg of Mediterranean mussels (Mytilus galloprovincialis) were purchased from a local supplier. Soft tissues were separated from the shells with the help of stainless steel knives. The shells were discarded and soft tissues were lyophilised on aluminium trays covered with plastic sheets under a vacuum of 10^{-1} Torr.

Lyophilised tissues were ground in a mixer made of stainless steel and glass only. The fraction of the material passing through a 150 µm sieve was collected and the residue was again ground in a porcelain ball mill. After grinding, the resulting powder was again sieved and the fraction passing through a 150 µm sieve was added to the first lot of powder.

Homogenization was done by mixing the entire quantity of powder having particle size <150 µm in a stainless steel rotating drum for 100 hours. Then, aliquots of 25 g were packaged into glass bottles sealed with plastic screw caps.

The homogeneity of the material for trace elements was checked by determining the concentration of some typical heavy metals in ten 500 mg-

samples taken randomly from the bulk of the powder. The samples were mineralized by wet ashing with nitric acid and zinc was determined by flame atomic absorption spectroscopy while the flameless technique was applied to the determination of Cd, Cu, Mn and Pb. Each sample solution was measured 10 times. A one-way variance analysis showed that the variance between samples could be explained by the analytical variance for each element determined. This material was, therefore, considered as homogeneous for the purpose of the intercalibration (at least for a sample weight $\geqslant$ 500 mg).

The water content of the lyophilized material as determined by drying to a constant weight at 85°C was found to be 6.5%. As, however, the water content may vary with changes in the ambient humidity and temperature, it was recommended that the water content of this material be always determined in a separate sub-sample (not that taken for analysis) by drying for 48 hours at 85°C.

All results were to be reported on a dry-weight basis.

4. Evaluation of results

The data provided by laboratories participating in this intercomparison were processed by a special statistical computer program which has been used already in previous intercomparisons organized by the IAEA. This program uses non-parametric techniques and hence does not assume a particular form for the data distribution. Outlying results were eliminated by a distribution-free procedure (2,3). The medians and their confidence intervals were accepted as the most robust estimations of the true values. The confidence intervals of the medians were estimated from a table given by Remington and Schork (4). The evaluation procedure which was used is described in Appendix 1.

The results of the data treatment are presented in tables as follows:

- Tables 1 to 5 provide general information on the intercomparison;
- Tables 6 to 51 give information on reported data;
- Tables 52 to 54 provide a summary of the results.

The meaning of the terms used in the tables is described in Appendix 2.

A graphical presentation of the results showing their distributions in the form of local density functions is given in Fig. 1 to 22. The figures also show the medians, means and modes together with their confidence intervals. A description of the figures and the procedures used for their establishment is given in Appendix 3.

The final concentration values obtained from the statistical evaluation were classified according to their analytical quality in the four following groups:

- Concentration values which can be recommended with a "satisfactory" degree of confidence
- Concentration values which can be recommended with an "acceptable" degree of confidence
- Non-certified information values
- Meaningless values, i.e. all concentration values which cannot be classified in one of three preceding groups.

The criteria which were used for the classification of the final concentration values in the above-mentioned groups are given in Appendix 4. The recommended concentration values ("satisfactory" or "acceptable") and the non-certified information values are given in Tables 55 and 56.

5. Discussion

As far as the pretreatment methods are concerned, Table 3 shows that the most frequently applied procedure was wet ashing (either under normal pressure or in closed decomposition vessels). Dry-ashing was less frequently used since this method cannot be applied in the case of volatile elements, e.g. mercury. Very often elements were determined without any pretreatment, in particular when the quantitative determination was done by instrumental neutron activation analysis.

Tables 4 and 5 show that atomic absorption spectroscopy in its various forms was the analytical method which was predominantly used in this intercomparison (45% of all determinations). It was followed by neutron activation analysis (28%), atomic emission spectroscopy (15%), and X-ray fluorescence (5%). Only a few results were obtained by other methods.

As it can be seen in the figures approximately symmetrical distributions of results were obtained (after rejection of outliers) in the case of aluminium, arsenic, cadmium, cobalt, copper, mercury, potassium and lead. Results obtained for these elements are, therefore, relatively well clustered around a central value (the mode of the distribution) which corresponds to the maximum of the local density function.

Asymmetrical distributions, on the other hand, were obtained in the case of chromium, sodium and nickel for which a positive skewness (towards the high values) was observed, and for iron and strontium which, on the contrary, exhibit a negative skewness (towards the low values). When we look at the individual results for chromium, we see that this skewness cannot be attributed to systematic errors since results obtained by different analytical methods do not seem to differ significantly. The same situation exists for

sodium and nickel. In the case of these elements, all outliers were detected on the same side (high values) and were obtained predominantly by atomic absorption spectroscopy. It seems, therefore, that for these three elements contamination errors (of a random type) during analysis rather than systematic errors are involved. For iron and strontium, on the contrary, outliers are on the side of the low values as well as the direction of the skewness of the distributions. Also here, systematic differences between analytical methods are not obvious. We notice, however, that neutron activation analysis exhibits a tendency to give higher results than AAS and AES. This may be due to the fact that nuclear methods are less sensitive to matrix effects than spectrochemical methods. This could explain the observed asymmetry of the distribution of these elements towards the low values.

The distribution of the manganese results is distinctive. The curve showing the variations of the local density function for this element has two maxima (case of a bimodal distribution). When we look at the individual results obtained for this element, we see that most of them were obtained by three different methods (NAA, AAS and AES). The medians and their confidence intervals for each group of results obtained by a given method were computed as follows:

	Median	Confidence interval
NAA-results	65.83	(57.87 - 79.83)
AAS-results	71.51	(63.27 - 78.45)
AES-results	65.00	(49.28 - 77.48)

Obviously, the medians of the three groups of results do not differ significantly and we cannot attribute the existence of two modes to systematic

differences between analytical methods. On the other hand, a survey of the applied pretreatment/preconcentration methods shows that the use of different methods by the participants cannot explain the bimodal character of the distribution of the manganese results either. It is not possible, therefore, to explain that particular distribution on the basis of the data which are available at present.

An other element for which a bimodal distribution was found is rubidium. Like manganese, the curve showing the variation of the local density function for this element exhibits two maxima. When we look at the individual results obtained for this element, we see that most of them (6 of 9) were obtained by instrumental neutron activation analysis. Two of the three results which were obtained by other methods (XRF and PIXE) are higher than the INAA results. The number of individual results, however, is too small to ascertain the existence of systematical errors between different analytical methods. The existence of a mode at about 5.60 $\mu g.\ g^{-1}$ seems to result from a group of two INAA-results very near each other at about 5.3 $\mu g.g^{-1}$. The procedure applied for the computation of the local density function did not remove completely this maximum which looks accidental if we take into account the limited number of data which are available in this particular case.

Two other elements (selenium and zinc) have distributions of results which, although they are not bimodal in the mathematical sense, exhibit a tendency to have two modal values as shown by the curves representing the variations of their local density functions. When we look at the individual results obtained for selenium, for instance, we see that we have two groups of results, the first one between 1.6 and 1.7 $\mu g.g^{-1}$, the other one between 2.0 and about 2.8 $\mu g.g^{-1}$. Neither the preferential use of an analytical method in a given group of results nor the pretreatment methods seem to be involved

in this case. It is, therefore, not possible to find an explanation for the distribution of selenium results on the basis of the limited number of data available at present. The same situation exists for zinc for which two maxima of frequency of results are observed, the first one between 150 and 160 $\mu g.g^{-1}$, the other one between 180 and 190 $\mu g.g^{-1}$. When we look at the individual results reported for this element, we see that most of them were obtained by three methods (NAA, AAS and AES). Only few results were obtained by other methods. The computed medians and their confidence intervals for each group of results obtained by a given method are as follows:

	Median	Confidence interval
NAA-results	156.05	(152.25 - 166.61)
AAS-results	166.20	(153.33 - 181.50)
AES-results	147.25	(126.67 - 164.00)

It is obvious that the medians of the three groups of results given by NAA, AAS and AES do not differ significantly and we cannot, therefore, attribute the apparent agglomeration of zinc determinations around two central values to systematic differences between analytical methods. As, on the other hand, the pretreatment/preconcentration methods do not seem to be involved here either, it is not possible to explain the asymmetrical distribution of the zinc results on the basis of the data reported so far for this element.

Aluminium exhibits an approximately symmetrical distribution but the results reported by the participants are in limited number and considerably dispersed. On the other hand, results obtained by INAA are systematically higher than the other results which were obtained by AES-ICP. It is, therefore, not even possible to give an information value for this element

until new data are available. It is interesting to notice that, in spite of the relatively high concentration level (100-200 $ug.g^{-1}$) the determination of this element in this material gives rise to analytical problems.

The following elements fulfil the qualification criteria 1a, 2, 3, 4 and 5 (see Appendix 4): As, Br, Cd, Cu and Hg. The concentration values of these elements, therefore, can be recommended with a "satisfactory" degree of confidence (class A).

At first sight, the following elements would also satisfy criteria 1a, 2, 3, 4 and 5 and should, in principle, be classified into the class A - results: Ca, Fe, Mn, Na, Sr and Zn. When we look at the individual results of calcium, we see that there is no obvious difference between the NAA, AAS and AES results. One result obtained by PIXE, however, is significantly lower than the other data and was, therefore, detected as "outlier". The limited number of reported results (only 8) suggests to be careful as far as the fulfilment of criterion 3 (agreement between different methods) is concerned. Owing to this doubt the concentration value of this element was classified as class B - result only. The other elements (Fe, Mn, Na, Sr and Zn) fulfil also criteria 1a, 2, 3, 4 and 5 and should, in principle, be classified into the class A - results. As discussed above, however, the distributions of the results obtained for these elements show strong tendencies either to asymmetry or to bimodality. As this brings a doubt about the accuracy of the determination of the most probable concentration value for these elements, it was decided to classify them into the class B - results (concentration values recommended with an "acceptable" degree of confidence).

Lead is perhaps the most difficult element of this intercomparison as far as the interpretation of the reported data is concerned. At first sight, the distribution of the results reported by the participants for this element

looks approximately symmetrical and it seems that the criteria for qualification of this element into the class A - results are fulfilled. When we look at the individual results reported for this element, however, we see that most results were obtained by atomic absorption spectroscopy. These results are spread over a relatively large range of concentrations and 80% of the "outliers"(5 for a total number of 32 results) were obtained by AAS. If we compare the accepted AAS-results with the data obtained by other methods (polarography, XRF and PIXE), we get the following values for the medians and their confidence intervals:

	Median	Confidence interval
AAS-results	1.78	(1.37 - 2.07)
Other results	2.87	(2.40 - 4.38)

Obviously, the distribution of the AAS-results reported for lead is significantly different from the distribution of the other results and we cannot consider that criterion 3 (no significant difference between the medians of the groups of results obtained by different analytical methods) is fulfilled for this element. For this reason it was decided to consider the concentration value obtained for lead as an information value only until more data become available for this element and enable us to clarify the disagreement observed between the results of different methods for this element.

6. Conclusion

The analytical results reported by the laboratories participating in this intercomparison have enabled us to certify the concentration of 16 elements in

the mussel homogenate MA-M-2/TM (Table 55). Information values could be established for 6 additional elements (Table 56).

The total number of outliers was moderate (11.7% of all results), as well as the total number of results given in the form "less than" (3.6%). The number of outlying results by participating laboratories varied between 0 and 6. 17 laboratories produced one or two outliers, 5 laboratories 3 or 4 outliers and 4 laboratories 5 or 6 outliers. The last four laboratories should carefully revise their analytical procedures for trace element analysis.

Note

The IAEA will appreciate all remarks and comments from analysts using the reference material MA-M-2/TM which is certified on the basis of this intercomparison. If a sufficient number of new results are received in the future, the recommended concentration values will be revised and a new report will be issued.

References

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(2) VEGLIA, A.: A nonparametric statistical method for the determination of a confidence interval for the mean of a set of results obtained in a laboratory intercomparison. Report IAEA/RL/84 (August 1981)

(3) PSZONICKI, L., HANNA, A.N., SUSCHNY, O.: Report on Intercomparison V-9 of the Determination of Trace Elements in Cotton Cellulose. Report IAEA/RL/97 (March 1983)

(4) REMINGTON, R.D., SCHORK, M.A.: Statistics with Application to the Biological and Health Sciences. Prentice Hall, Inc., Engelwood, Cliffs, N.J. (1970).

APPENDIX 1

Data handling and statistical evaluation

The participants were requested to make at least three, preferably six separate determinations of each element and to report the results of all determinations as net values, i.e. after correcting for the blanks. Some laboratories, however, sent in the results of only one or two determinations.

The computer program in its present form accepts a maximum of 6 individual results for a given element from one laboratory. If the number of reported results obtained by the same analytical procedure was larger, only six results chosen at random were included and the others were ignored.

The results supplied in the form "less than" were tabulated only as additional information values but not used for statistical evaluation.

Results described as doubtful by the laboratory itself were not included.

The main stages of the general statistical procedure used for evaluation of data were as follows:

1. Laboratory means were calculated on the basis of the reported individual determinations.
2. All laboratory means for one element were treated as a set of data points and arranged by their ascending values (see Tables 6 to 51).
3. The set of data was tested for outlying results and the outliers were rejected, using the following procedure:

- the data points most distant from the mean of the set were tested sequentially one after the other;

- for every tested point an h-value was calculated:

$$h = (x_j - \bar{x}_{n-1})\,(S_{n-1})^{-1}\left(\frac{n}{n-1}\right)^{-1/2}$$

where: x_j - value of the point to be tested

$\bar{x}_{n-1}$ - arithmetic mean of the set without x_j

S_{n-1} - standard deviation of the set without x_j

n - total number of the data points in the set

- if the h-value was found to be larger than 3.162, then x_j was rejected as an outlier at the significance level of 0.05, and the testing procedure was continued for the next most distant point;

- if h was smaller than 3.162, then the point was provisionally excluded from the set of data and the next point was tested. If for this next point the h-value was also smaller than 3.162, both points were accepted, and the procedure was finished, however, if for the second point h was larger than 3.162, both points were rejected as outliers and the testing was continued for the next data points of the set.

- results rejected as outliers are indicated in Tables by an asterisk put next to a laboratory mean.

4. The overall median was calculated in the usual way and its confidence limits were found in the table given by Remington and Schork (4).
5. For comparison, the arithmetic mean and its confidence limits (assuming a normal distribution of data) and the mode (see Appendix 3) are also calculated.
6. The distribution of the results for each element was plotted as a function of local density of the data (see Appendix 3).

APPENDIX 2

Description of terms used in the tables

Tables 1 to 5

Method Code No.: The main features of the analytical methods used by individual laboratories are shown in the form of code numbers. The code numbers appearing before the point refer to sample pretreatment methods such as dissolution, separation and/or preconcentration, the key to which is given in Table 1. The use of two digits before the point means that a combination of two different pretreatment methods was applied, e.g. acid digestion and solvent extraction.

The code number appearing after the point refers to the method used for the quantitative determination of an element. The first digit after the point characterizes the type of method, e.g. neutron activation analysis, atomic absorption spectroscopy, etc. The second digit gives more exact information about the analytical procedure used, e.g. neutron activation with radiochemical separation, flameless atomic absorption, energy-dispersive X-ray fluorescence.

Method Abbreviation: The combination of capital letters corresponding to the first letters of the name of the analytical method. Each method abbreviation refers to the first digit after the point in the method code.

Frequency of the Application of Pretreatment Methods: The relative number of results, which were obtained by a single procedure using the pretreatment method indicated by "Method Code No" (figures before the point), calculated as percent of all results reported for a given element including "less than"-results. Because sometimes the combination of more than one pretreatment method was used, the sum of the frequencies for one element may exceed 100%.

Frequency of the Application of Analytical Methods: The relative number of results, which were obtained by the analytical method indicated by "Method Code No." (figures after the point), calculated as percent of all results reported for a given element including "less than"-results.

Two different types of frequencies are listed in Table 4: frequencies of exactly specified methods (two digits Code No.) and frequencies of the group of methods (one digit Code No.). The frequencies of the second type were calculated as the sum of the frequencies of all methods of the group concerned.

Laboratory Mean: The arithmetic mean computed from all individual results supplied by a given laboratory. An asterisk next to a laboratory mean denotes that this mean was classified as an outlier and was not taken into account when computing the overall mean and median.

Outlier: A laboratory mean classified as an outlying value in the set of all laboratory means obtained for the element concerned (see Appendix 1).

"less than"-Result ("<"-result): A result reported by a laboratory as "less than". If a laboratory supplied some different "less than"-results for an element, then only one, viz. the highest, was accepted.

Total Number of Laboratory means: The total number of all laboratory means and "less than"-results obtained for all elements which were to be determined in the intercomparison run.

Total Number of Outliers: The sum of outliers obtained in the intercomparison run for all elements which were to be determined. Its relative number was calculated as percent of the "Total Number of Laboratory Means".

Total Number of "less than"-Results: The sum of all "less than"-results reported in this intercomparison. Its relative value is calculated as a percentage of the total number of laboratory means.

Number of Laboratory Means, Outliers, and "less than"-Results by the Method: Numbers corresponding to the above defined "total numbers" but concerning the results obtained by one analytical method indicated in the table by "Code No" and "abbreviation". Their relative values were calculated as percentage of "Number of Laboratory Means by the Method".

Tables 6 to 51

Method Code No:)

Laboratory Mean:) See description of Tables 1 to 5

"Less than"-Results:)

Input Value: Known concentration of an element put in and homogeneously distributed in the bulk of the material to be analysed (Not applicable in the reported intercomparison).

Units: Units in which the concentration of an element to be determined is expressed, namely : NANOG/G = $ng.g^{-1}$, MICROG/G = $\mu g.g^{-1}$, MILIG/G = $mg.g^{-1}$.

Laboratory Code No.: Each laboratory is represented by a code number, which remains unchanged throughout the tables. These numbers, however, do not correspond to the sequence of laboratories in the list of participants given at the end of this report, so that anonymity is preserved. When a laboratory has used more than one analytical procedure for the determination of the same element, then the results are distinguished as different sets of data by different capital letters added to the code number.

Number of Determinations: The number of individual determinations performed by the laboratory using the same analytical procedure ("less than"-results excluded).

Laboratory Standard Deviation: The absolute and relative laboratory standard deviations are calculated in the usual way.

Estimated Laboratory Error: The participants' own estimate of the relative standard deviation expressed in percent. The figure before the point refers to the error due to counting statistics (only for radiometric methods), and that after the point to the error due to a complete analytical procedure.

Deviation from Input Value: Not applicable in the reported intercomparison.

R-Value: Not applicable in the reported intercomparison.

Tables 52 to 54

Method Code No:)
Method Abbrevation:) see description of
Laboratory Mean:) Tables 1 to 5.
Outliers:)

Unit:) See description of
Input Value:) Tables 6 to 51

Number of Reported Results; Laboratory Means: Number of laboratory means (excluding "less than"-Results) reported for an element.

Number of Reported Results; Individual Determinations: Number of individual determinations (excluding "less than"-Results) reported by all laboratories for an element.

Number of Accepted Results; Laboratory means: Number of laboratory means (excluding "less than"-Results and outliers) reported by all laboratories for an element.

Number of Accepted Results; Individual Determinations: Number of individual determinations (excluding "less than"-Results and outliers) reported by all laboratories for an element.

Total Range of Laboratory Means: The range between the lowest and the highest of the "Reported Results".

Range of Accepted Laboratory Means: The range between the lowest and the highest of the "Accepted Results".

Percentage of outlying Laboratories: Relative number of laboratories which have supplied outlying results given in percent of the total number of laboratories which have reported results.

Percentage of Outliers: Percentage of "Outlying Laboratories".

Percentage of Laboratories with an R-Value larger than 1: Not applicable in the reported intercomparison.

Percentage of Laboratories with no R-Value: Not applicable in the reported intercomparison.

Overall mean: Non-weighted mean of all accepted "Laboratory Means", after elimination of outliers.

Confidence Limits of the Overall mean: Calculated on the assumption of normal distribution of laboratory means. If for an element the calculated lower confidence limit was found to be negative, then it was taken to be equal to zero.

Relative Uncertainty of the Mean: The differences between the overall mean and its confidence limits expressed as percent of this overall mean.

Overall Median: The median value of all "accepted" laboratory means (after elimination of outliers).

Confidence Limits of the Overall Median: Values of the data points (overall means) which were found in the table given by Remington and Schork (4) for a significance level of 0.05.

Relative Uncertainty of the Overall Median: the differences between the overall median and its confidence limits expressed as percent of the value of this median. Notice that the confidence interval can be distributed asymmetrically around the median.

Overall Mode: The concentration value corresponding to the maximum local density of laboratory means (see Appendix 3).

Relative Deviation from the Input Value: Not applicable in the reported intercomparison.

Mean Value by the Method: The arithmetic mean of results (laboratory means) obtained by the method referred to by the "Code No".

Median Value by the Method: The median of results (laboratory means) obtained by the method referred to by the "Code No".

APPENDIX 3

Description of figures

The data distribution is presented graphically in the form of relative local density of data points as a function of corrected values of these points. Because the data represent the values of a random variable they may form small clusters with a very high local density which does not result from the distribution of the total set. The plotted values, therefore, were calculated by using the following smoothing procedure:

1. For every data point a new corrected value was calculated as the average value of this point and of two neighbouring points. This operation was repeated 0.1n times, where "n" is the total number of accepted data points rounded to full tens.

2. The absolute local density values in the nearest vicinity of every corrected point were calculated as the reciprocal values of the mean distance between this point and two neighbouring points.
3. The function obtained in this way was smoothed by calculation for each point of a mean value of this point and 0.2n neighbouring points. This operation was also repeated 0.1n times ("n"-value see para. 1). Finally, the function was transformed into the relative local density function by normalizing its maximum to 100.

The relative local density functions $\bar{\Phi}(X_i)$ plotted against the corrected values of results are shown in Figures 1 - 22 as the continuous lines with small circles. They represent only the distribution of experimental data, not the shape of the general distribution in a statistical sense. The modal values were estimated as values of the corrected points corresponding to the maximum of the density functions. The values of original results (laboratory means) are indicated directly above the abscissa. The values of the overall means and medians accompanied by their confidence limits and values of the modes are indicated in the plots by vertical arrows. The values of outliers are listed on both sides of the plots with horizontal arrows indicating the direction of their position.

For multimodal curves (more than one maximum) the function $\bar{\Phi}(X_i)$ was processed further by the same procedure as given in para. 3. The operation was repeated until a unimodal plot was achieved.

The transformed unimodal function was plotted as a continuous line without circles, e.g. figures 14 and 18. The modal value was estimated for this function.

APPENDIX 4

Criteria for certification

I. Qualification criteria

1. The relative uncertainty of the overall median (at a significance level of 0.05) does not exceed the following limits:

   a) Major and minor elements: ± 10%

      Trace elements: ± 20%

   b) Major and minor elements: ± 20%

      Trace elements: ± 35%.

2. The overall median is based on data obtained by at least two different analytical methods.

3. There is no significant difference (at the level of 0.05) between the medians of all groups of laboratory means obtained by different analytical methods.

4. The relative number of laboratory means rejected as outliers does not exceed 30%.

5. The overall median is calculated on the basis of at least 5 laboratory means.

II. Certification

A concentration value for an element (overall median) is classified as a recommended value with a satisfactory degree of confidence (Class A) when it fulfils criteria 1a, 2, 3, 4 and 5.

A concentration value for an element (overall median) is classified as a recommended value with an acceptable degree of confidence (Class B) when it fulfils criteria 1b, 2, 3, 4 and 5.

A concentration value is classified as a non-certified information value when it fulfils at least criteria 1a or 1b and when the overall median is calculated on the basis of at least 3 laboratory means.

Concentration values which cannot be classified into one of the above-mentioned categories are regarded as meaningless until additional results are obtained for the element concerned.

Table 1.

Code numbers of pretreatment methods used in the Intercomparison MA-M-2/TM (not including radiochemical separation after neutron activation)

Method Code No	Method
.	Not communicated
0.	No pretreatment
1.	Dry ashing
2.	Wet ashing (normal pressure)
3.	Wet ashing (pressure decomposition vessel)
4.	Addition of a reducer
5.	Extraction
6.	Dissolution
7.	Pellet formation
8.	Ion-exchange chromatography.

Table 2

Code numbers and abbreviations of methods used for quantitative determination of trace elements in the Intercomparison MA-M-2/TM

Code No.	Abbre-viation	Method
.0	-	Not indicated
.10	NAA	Neutron activation analysis (without specification)
.11		NAA - instrumental
.12		NAA - with radiochemical separations
.20	AAS	Atomic absorption spectroscopy (without specification)
.21		AAS - flame technique
.22		AAS - graphite furnace technique
.23		AAS - hydride generation technique
.24		AAS - cold-vapour technique
.30	AES	Atomic emission spectroscopy (without specification)
.31		Flame emission spectroscopy
.32		Inductively coupled plasma emission spectroscopy
.40	XRF	X-ray fluorescence (without specification)
.41		Energy-dispersive XRF
.42		Wavelength-dispersive XRF
.43		Total-reflection XRF
.50	FL	Fluorimetry
.60	PIX	Proton-induced X-ray emission
.70	EM	Polarography or anodic stripping voltammetry
.80	SP	Spectrophotometry, colorimetry
.90	OM	Other methods

TABLE NO. 3

FREQUENCY OF THE APPLICATION OF PRETREATMENT METHODS USED IN INTERCOMPARISON FOR IAEA/RUN MA-M-2/TM

(NOT INCLUDING RADIOCHEMICAL SEPARATION AFTER NEUTRON ACTIVATION).

% OF USE IN THE RUN FOR ELEMENT

METHOD CODES: ELEMENT	0.	1.	2.	3.	4.	5.	6.	7.	8. (as in Table 1)
AG	58.3	8.3	25.0	8.3			8.3		
AL	57.1		28.6	14.3					
AS	29.4	5.9	29.4	23.5	29.4			11.8	
AU	100.0								
B		50.0		50.0			50.0		
BA			50.0	50.0					
BR	66.7							33.3	
CA	25.0	12.5	25.0	25.0			12.5	12.5	
CO	7.7	20.5	59.0	12.8		2.6	17.9		2.6
CE	100.0								
CL	60.0							40.0	
CO	46.2	11.5	38.5	3.8			7.7		3.8
CR	37.5	9.4	37.5	15.6			9.4		
CS	100.0								
CU	13.0	21.7	45.7	15.2		2.2	23.9	4.3	2.2
EU	100.0								
F			100.0						
FE	25.0	15.0	45.0	10.0			12.5	5.0	2.5
HF	100.0								
HG	21.7		60.9	17.4	69.6				
I	100.0								
K	33.3	11.1	22.2	11.1			11.1	22.2	
LA	100.0								
LI			100.0						
MG	28.6	14.3	42.9	14.3			14.3		
MN	19.4	16.7	47.2	13.9			19.4	2.8	2.8
MO	25.0		25.0	50.0			25.0		
NA	57.1	14.3	28.6				14.3		
NI	12.5	20.8	45.8	16.7			16.7	4.2	4.2
P				100.0					
PB	5.9	23.5	52.9	11.8		8.8	17.6	5.9	2.9
RB	72.7			9.1				18.2	
S				50.0				50.0	
SB	71.4		28.6						
SC	100.0								
SE	55.6		27.8	11.1	11.1			5.6	
SR	20.0		30.0	30.0			10.0	20.0	
TA	100.0								
TB	100.0								
TE	100.0								
TH	100.0								
TI			50.0	50.0			50.0		
TL				100.0					
U	100.0								
V	50.0		30.0	20.0					
ZN	25.0	16.7	43.8	10.4			14.6	4.2	2.1

TABLE NO. 4

FREQUENCY OF THE APPLICATION OF ANALYTICAL METHODS USED FOR THE DETERMINATION OF ELEMENTS IN INTERCOMPARISON IAEA/RUN MA-M-2/TM

METHOD CODE	METHOD ABBR.	% OF USE IN THE RUN FOR ELEMENT AG	AL	AS	AU	B	BA	BR	CA	CD	CE	CL
.1	NAA	50.0	57.1	23.5	100.0			66.7	25.0	5.1	100.0	60.0
.11		41.7	57.1	11.8	100.0			66.7	25.0	2.6	100.0	60.0
.12		8.3		11.8						2.6		
.2	AAS	41.7		35.3					12.5	74.4		
.20										5.1		
.21									12.5	30.8		
.22		41.7		5.9						38.5		
.23				29.4								
.24												
.3	AES	8.3	42.9	23.5		100.0	100.0		37.5	10.3		
.31												
.32		8.3	42.9	23.5		100.0	100.0		37.5	10.3		
.4	XRF			11.8				16.7	12.5	2.6		20.0
.41				5.9				16.7				20.0
.43				5.9					12.5	2.6		
.5	FL											
.50												
.6	PIX			5.9				16.7	12.5			20.0
.60				5.9				16.7	12.5			20.0
.7	ECM									7.7		
.70										7.7		
.9	OM											
.90												

(METHOD CODE NUMBERS AS IN TABLE 2)

TABLE NO. 4 (CONTINUED)

FREQUENCY OF THE APPLICATION OF ANALYTICAL METHODS USED FOR THE DETERMINATION OF ELEMENTS IN INTERCOMPARISON IAEA/RUN MA-M-2/TM

METHOD CODE	METHOD ABBR.	% OF USE IN THE RUN FOR ELEMENT CO	CR	CS	CU	EU	F	FE	HF	HG	I	K	LA
.1	NAA	42.3	31.3	100.0	8.7	100.0		25.0	100.0	17.4	100.0	33.3	100.0
.11		38.5	31.3	100.0	4.3	100.0		22.5	100.0	13.0	100.0	33.3	100.0
.12		3.8			4.3			2.5		4.3			
.2	AAS	46.2	56.3		67.4			52.5		73.9			
.20		7.7	3.1		4.3			5.0					
.21		26.9	28.1		39.1			42.5					
.22		11.5	25.0		23.9			5.0		4.3			
.23										4.3			
.24										65.2			
.3	AES	7.7	9.4		13.0			15.0		4.3		33.3	
.31												11.1	
.32		7.7	9.4		13.0			15.0		4.3		22.2	
.4	XRF		3.1		4.3			5.0		4.3		22.2	
.41					2.2			2.5				11.1	
.43			3.1		2.2			2.5		4.3		11.1	
.5	FL												
.50													
.6	PIX				2.2			2.5				11.1	
.60					2.2			2.5				11.1	
.7	ECM	3.8			4.3								
.70		3.8			4.3								
.9	OM						100.0						
.90							100.0						

(METHOD CODE NUMBERS AS IN TABLE 2)

TABLE NO. 4 (CONTINUED)

FREQUENCY OF THE APPLICATION OF ANALYTICAL METHODS USED FOR THE DETERMINATION OF ELEMENTS IN INTERCOMPARISON IAEA/RUN MA-M-2/TM

METHOD CODE	METHOD ABBR.	% OF USE IN THE RUN FOR ELEMENT											
		LI	MG	MN	MO	NA	NI	P	PB	RB	S	SB	SC
.1	NAA		28.6	19.4		57.1	8.3			72.7		71.4	100.0
.11			28.6	19.4		57.1	8.3			72.7		57.1	100.0
.12												14.3	
.2	AAS	100.0	14.3	55.6	50.0		58.3		76.5			14.3	
.20				5.6			8.3		5.9				
.21		100.0	14.3	44.4			37.5		29.4				
.22				5.6	50.0		12.5		41.2			14.3	
.23													
.24													
.3	AES		57.1	19.4	25.0	42.9	20.8	100.0	5.9		25.0	14.3	
.31						14.3							
.32			57.1	19.4	25.0	28.6	20.8	100.0	5.9		25.0	14.3	
.4	XRF			2.8	25.0		4.2		5.9	18.2	50.0		
.41									2.9	9.1	25.0		
.43				2.8	25.0		4.2		2.9	9.1	25.0		
.5	FL												
.50													
.6	PIX			2.8			4.2		2.9	9.1	25.0		
.60				2.8			4.2		2.9	9.1	25.0		
.7	ECM						4.2		8.8				
.70							4.2		8.8				
.9	OM												
.90													

(METHOD CODE NUMBERS AS IN TABLE 2)

TABLE NO. 4 (CONTINUED)

FREQUENCY OF THE APPLICATION OF ANALYTICAL METHODS USED FOR THE DETERMINATION OF ELEMENTS IN INTERCOMPARISON IAEA/RUN MA-M-2/TM

METHOD CODE	METHOD ABBR.	% OF USE IN THE RUN FOR ELEMENT SE	SR	IA	TB	TE	TH	TI	TL	U	V	ZN
.1	NAA	55.6	20.0	100.0	100.0	100.0	100.0			100.0	40.0	22.9
.11		50.0	20.0	100.0	100.0	100.0	100.0			100.0	40.0	18.7
.12		5.6										4.2
.2	AAS	22.2	10.0						100.0		20.0	56.2
.20												4.2
.21			10.0									45.8
.22		11.1							100.0		20.0	6.2
.23		11.1										
.24												
.3	AES	5.6	40.0					100.0			30.0	12.5
.31												
.32		5.6	40.0					100.0			30.0	12.5
.4	XRF	5.6	20.0								10.0	4.2
.41			10.0									2.1
.43		5.6	10.0								10.0	2.1
.5	FL	5.6										
.50		5.6										
.6	PIX	5.6	10.0									2.1
.60		5.6	10.0									2.1
.7	ECM											2.1
.70												2.1
.9	OM											
.90												

(METHOD CODE NUMBERS AS IN TABLE 2)

TABLE NO. 5

GENERAL FREQUENCY OF THE APPLICATION OF
ANALYTICAL METHODS USED FOR DETERMINATION
OF ELEMENTS IN INTERCOMPARISON IAEA/RUN MA-M-2/TM

TOTAL NUMBER OF LAB MEANS 529	TOTAL NUMBER OF OUTLIERS	ABS	62	TOTAL NUMBER OF RESULTS "<"	ABS	19		
		REL(%)	11.7		REL(%)	3.6		
METHOD CODE NO.:	.1	.2	.3	.4	.5	.6	.7	.9
METHOD ABBREVIATION	NAA	AAS	AES	XRF	FL	PIX	ECM	OM
NUMBER OF LAB.MEANS BY THE METHOD	150	240	82	29	1	15	11	1
PERCENTAGE OF LAB. MEANS BY THE METHOD	28.4	45.4	15.5	5.5	0.2	2.8	2.1	0.2
NUMBER OF OUTLIERS BY THE METHOD	15	36	4	4		1	2	
PERCENTAGE OF OUT-LIERS BY THE METHOD	10.0	15.0	4.9	13.8		6.7	18.2	
NUMBER OF RESULTS GIVEN AS "<" BY THE METHOD	6	8	5					
PERCENTAGE OF RESULTS GIVEN AS "<" BY THE METHOD	4.0	3.3	6.1					

(METHOD CODE NUMBERS AS IN TABLE 2)

TABLE NO. 6

RESULTS OF INTERCOMPARISON FOR AG IN IAEA/RUN MA-M-2/TM

UNITS NANOG/G INPUT VALUE .

NO.	LAB. CODE NO.	METH. CODE NO.	NO. OF DETERM.	LAB. MEAN	LAB. STANDARD DEV. ABS	REL %	ESTIM. LAB. ERROR%	DEVIATION FROM INPUT VALUE	R
1	10A	2.22	4	24.025*	9.981	41.546	.50	.	.
2	15	0.12	6	45.167	3.869	8.565	3.09	.	.
3	10B	0.22	4	46.350	5.053	10.903	.16	.	.
4	17	2.22	6	54.167	5.845	10.791	.15	.	.
5	43	0.11	4	57.500	9.574	16.651	19.30	.	.
6	26A	0.11	6	61.917	2.795	4.515	5.08	.	.
7	37	0.11	3	350.000*	52.915	15.119	15.16	.	.
8	47	16.22	4	394.500*	9.000	2.281	.03	.	.
				"<"					
9	28	3.22	.	50.000					
10	21	0.11	.	80.000					
11	19	0.11	.	100.000					
12	22	2.32	.	100.000					

TABLE NO. 7

RESULTS OF INTERCOMPARISON FOR AL IN IAEA/RUN MA-M-2/TM

UNITS MICROG/G INPUT VALUE .

NO.	LAB. CODE NO.	METH. CODE NO.	NO. OF DETERM.	LAB. MEAN	LAB. STANDARD DEV. ABS	REL %	ESTIM. LAB. ERROR%	DEVIATION FROM INPUT VALUE	R
1	17	2.32	6	58.583	2.990	5.104	.07	.	.
2	22	2.32	3	120.000	7.211	6.009	.06	.	.
3	31	3.32	6	174.000	6.419	3.689	.04	.	.
4	40	0.11	6	194.000	8.270	4.263	2.06	.	.
5	51	0.11	3	198.703	4.884	2.458	3.	.	.
6	21	0.11	4	318.500	13.000	4.082	5.10	.	.
7	26A	0.11	6	359.167	24.170	6.729	5.08	.	.

TABLE NO. 8

RESULTS OF INTERCOMPARISON FOR AS IN IAEA/RUN MA-M-2/TM

UNITS MICROG/G INPUT VALUE .

NO.	LAB. CODE NO.	METH. CODE NO.	NO. OF DETERM.	LAB. MEAN	LAB. STANDARD DEV. ABS	REL %	ESTIM. LAB. ERROR%	DEVIATION FROM INPUT VALUE	R
1	1	24.23	5	0.566*	0.027	4.774	.05	.	.
2	27	24.23	6	4.317*	0.098	2.278	.02	.	.
3	38	7.41	1	7.100*	.	.	.07	.	.
4	21	0.11	4	10.025	1.861	18.561	10.15	.	.
5	33	3.32	6	10.833	0.929	8.574	.09	.	.
6	16	7.60	6	11.817	1.784	15.095	4.20	.	.
7	17	2.32	6	12.333	0.606	4.910	.06	.	.
8	51	0.12	3	12.349	0.040	0.324	3.	.	.
9	26A	0.11	6	12.717	1.114	8.763	8.10	.	.
10	18	34.23	6	12.850	0.315	2.449	.02	.	.
11	47	14.23	4	12.975	0.256	1.970	.02	.	.
12	25	24.23	6	13.133	0.361	2.752	.05	.	.
13	26B	3.43	6	13.167	0.234	1.776	.10	.	.
14	42	2.32	4	14.360	0.710	4.945	.05	.	.
15	31	3.32	6	14.792	1.163	7.864	.08	.	.
16	15	0.12	6	15.250	0.308	2.021	1.02	.	.
				"<"					
17	48	0.22	.	0.500					

TABLE NO. 9

RESULTS OF INTERCOMPARISON FOR AU IN IAEA/RUN MA-M-2/TM

UNITS NANOG/G INPUT VALUE .

NO.	LAB. CODE NO.	METH. CODE NO.	NO. OF DETERM.	LAB. MEAN	LAB. STANDARD DEV. ABS	REL %	ESTIM. LAB. ERROR%	DEVIATION FROM INPUT VALUE	R
1	41	0.11	6	14.433	1.544	10.695	.10	.	.
2	21	0.11	4	15.500	1.915	12.354	15.20	.	.
3	26A	0.11	6	16.217	0.571	3.519	5.08	.	.
4	19	0.11	6	42.500*	8.781	20.660	.	.	.

TABLE NO. 10

RESULTS OF INTERCOMPARISON FOR B IN IAEA/RUN MA-M-2/TM

UNITS MICROG/G INPUT VALUE .

NO.	LAB. CODE NO.	METH. CODE NO.	NO. OF DETERM.	LAB. MEAN	LAB. STANDARD DEV. ABS	REL %	ESTIM. LAB. ERROR%	DEVIATION FROM INPUT VALUE	R
1	33	3.32	6	26.500	1.375	5.191	.05	.	.
2	42	16.32	4	30.475	0.171	0.560	.01	.	.

TABLE NO. 11

RESULTS OF INTERCOMPARISON FOR BA IN IAEA/RUN MA-M-2/TM

UNITS MICROG/G INPUT VALUE .

NO.	LAB. CODE NO.	METH. CODE NO.	NO. OF DETERM.	LAB. MEAN	LAB. STANDARD DEV. ABS	REL %	ESTIM. LAB. ERROR%	DEVIATION FROM INPUT VALUE	R
1	17	2.32	6	0.720	0.035	4.811	.09	.	.
2	31	3.32	6	1.547	0.065	4.203	.04	.	.

TABLE NO. 12

RESULTS OF INTERCOMPARISON FOR BR IN IAEA/RUN MA-M-2/TM

UNITS MICROG/G INPUT VALUE .

NO.	LAB. CODE NO.	METH. CODE NO.	NO. OF DETERM.	LAB. MEAN	LAB. STANDARD DEV. ABS	REL %	ESTIM. LAB. ERROR%	DEVIATION FROM INPUT VALUE	R
1	52	0.11	6	304.167	10.980	3.610	2.04	.	.
2	38	7.41	6	314.033	2.370	0.755	.01	.	.
3	16	7.60	6	355.833	30.630	8.608	2.15	.	.
4	46	0.11	4	359.750	13.841	3.847	.	.	.
5	51	0.11	3	368.300	0.390	0.106	1.	.	.
6	26A	0.11	6	416.667	6.055	1.453	1.08	.	.

TABLE NO. 13

RESULTS OF INTERCOMPARISON FOR CA IN IAEA/RUN MA-M-2/TM

UNITS MILIG/G INPUT VALUE .

NO.	LAB. CODE NO.	METH. CODE NO.	NO. OF DETERM.	LAB. MEAN	LAB. STANDARD DEV. ABS	LAB. STANDARD DEV. REL %	ESTIM. LAB. ERROR%	DEVIATION FROM INPUT VALUE	R
1	16	7.60	6	10.450*	1.705	16.316	2.20	.	.
2	42	16.32	4	13.684	0.289	2.113	.02	.	.
3	31	3.32	6	13.734	0.250	1.820	.02	.	.
4	10A	2.21	5	14.648	0.295	2.011	.03	.	.
5	22	2.32	3	14.800	0.200	1.351	.01	.	.
6	51	0.11	3	15.247	0.043	0.282	10.	.	.
7	26B	3.43	6	15.397	0.552	3.588	.10	.	.
8	26A	0.11	6	16.067	0.750	4.669	1.10	.	.

TABLE NO. 14

RESULTS OF INTERCOMPARISON FOR GD IN IAEA/RUN MA-M-2/TM

UNITS MICROG/G INPUT VALUE .

NO.	LAB. CODE NO.	METH. CODE NO.	NO. OF DETERM.	LAB. MEAN	LAB. STANDARD DEV. ABS	LAB. STANDARD DEV. REL %	ESTIM. LAB. ERROR%	DEVIATION FROM INPUT VALUE	R
1	13A	18.20	1	0.260	.	.	.	.	.
2	10A	2.22	5	0.379	0.069	18.310	.23	.	.
3	13B	2.20	1	0.380	.	.	.	.	.
4	28	3.22	5	0.430	0.035	8.056	.07	.	.
5	36	2.22	6	0.434	0.114	26.148	.	.	.
6	53	16.70	1	0.730	.	.	.	.	.
7	33	3.32	6	1.005	0.097	9.663	.10	.	.
8	31	3.22	6	1.073	0.026	2.406	.03	.	.
9	34	2.22	6	1.127	0.025	2.222	.02	.	.
10	27	2.22	6	1.155	0.037	3.181	.03	.	.
11	17	2.32	6	1.167	0.041	3.499	.06	.	.
12	32	2.21	6	1.167	0.082	6.999	.05	.	.
13	2	16.22	4	1.172	0.061	5.229	.	.	.
14	42	16.32	4	1.210	0.075	6.185	.06	.	.
15	48	0.22	6	1.233	0.074	6.017	.	.	.
16	25	2.21	5	1.260	0.114	9.049	.10	.	.
17	3	2.21	5	1.280	0.045	3.494	.02	.	.
18	1	3.22	6	1.313	0.068	5.201	.05	.	.
19	18	2.21	6	1.333	0.516	38.730	.39	.	.
20	47	16.22	4	1.349	0.078	5.754	.06	.	.
21	9	2.21	6	1.383	0.020	1.421	.01	.	.
22	8	2.21	6	1.390	0.141	10.144	.10	.	.
23	54	16.22	1	1.440	.	.	.	.	.
24	15	0.12	6	1.493	0.092	6.133	2.06	.	.
25	12B	2.70	6	1.533	0.121	7.898	.	.	.
26	55	2.22	5	1.548	0.048	3.078	.10	.	.
27	6	25.22	4	1.550	0.022	1.394	.	.	.
28	49	2.21	6	1.567	0.124	7.928	.08	.	.
29	14	16.21	5	1.620	0.215	13.275	.13	.	.
30	26B	3.43	3	1.653	0.142	8.582	.20	.	.
31	22	2.32	3	1.667	0.208	12.490	.12	.	.
32	30	2.22	1	1.690	.	.	.02	.	.
33	20	2.21	6	1.747	0.121	6.943	.02	.	.
34	23	2.22	6	1.788	0.047	2.633	.03	.	.
35	24	2.21	6	2.335	0.108	4.626	.03	.	.
36	35	2.21	6	2.433	0.339	13.916	.15	.	.
37	29	16.70	4	3.282*	0.067	2.027	.02	.	.
38	4	2.21	4	6.225*	0.487	7.816	.08	.	.
				"<"					
39	26A	0.11	.	2.500					

TABLE NO. 15

RESULTS OF INTERCOMPARISON FOR CE IN IAEA/RUN MA-M-2/TM

UNITS MICROG/G INPUT VALUE .

NO.	LAB. CODE NO.	METH. CODE NO.	NO. OF DETERM.	LAB. MEAN	LAB. STANDARD DEV. ABS	REL %	ESTIM. LAB. ERROR%	DEVIATION FROM INPUT VALUE	R
1	26A	0.11	6	0.352	0.149	42.385	7.15	.	.
2	21	0.11	4	0.667	0.060	9.020	9.12	.	.

TABLE NO. 16

RESULTS OF INTERCOMPARISON FOR CL IN IAEA/RUN MA-M-2/TM

UNITS MILIG/G INPUT VALUE .

NO.	LAB. CODE NO.	METH. CODE NO.	NO. OF DETERM.	LAB. MEAN	LAB. STANDARD DEV. ABS	REL %	ESTIM. LAB. ERROR%	DEVIATION FROM INPUT VALUE	R
1	38	7.41	6	53.328*	3.095	5.803	.06	.	.
2	51	0.11	3	75.572*	0.853	1.129	1.	.	.
3	46	0.11	6	83.400	1.035	1.241	.	.	.
4	26A	0.11	6	87.067	5.496	6.312	1.10	.	.
5	16	7.60	6	87.833	8.796	10.014	2.20	.	.

TABLE NO. 17

RESULTS OF INTERCOMPARISON FOR CO IN IAEA/RUN MA-M-2/TM

UNITS MICROG/G INPUT VALUE .

NO.	LAB. CODE NO.	METH. CODE NO.	NO. OF DETERM.	LAB. MEAN	LAB. STANDARD DEV. ABS	REL %	ESTIM. LAB. ERROR%	DEVIATION FROM INPUT VALUE	R
1	40	0.11	6	0.170	0.023	13.331	6.13	.	.
2	11	0.11	2	0.370	0.014	3.822	8.10	.	.
3	31	3.22	5	0.538	0.040	7.365	.07	.	.
4	17	2.32	6	0.750	0.032	4.216	.14	.	.
5	19	0.11	6	0.757	0.063	8.386	.	.	.
6	22	2.32	3	0.797	0.121	15.132	.15	.	.
7	15	0.12	6	0.828	0.020	2.464	2.03	.	.
8	41	0.11	6	0.863	0.010	1.164	.01	.	.
9	51	0.11	3	0.864	0.003	0.372	4.	.	.
10	26A	0.11	6	0.882	0.037	4.159	1.05	.	.
11	21	0.11	4	0.905	0.010	1.105	6.07	.	.
12	37	0.11	3	0.953	0.127	13.323	2.03	.	.
13	13A	18.20	1	0.970	.	.	.	.	.
14	20	2.21	6	0.998	0.147	14.686	.20	.	.
15	32	2.21	6	1.067	0.082	7.655	.08	.	.
16	10A	2.22	4	1.075	0.109	10.176	.15	.	.
17	29	16.70	4	1.137	0.013	1.106	.01	.	.
18	43	0.11	4	1.227	0.013	1.025	1.10	.	.
19	13B	2.20	1	1.410	.	.	.	.	.
20	10B	0.22	3	2.310*	0.339	14.661	.16	.	.
21	24	2.21	6	2.717*	0.299	11.022	.11	.	.
22	8	2.21	6	2.948*	0.391	13.276	.13	.	.
23	35	2.21	6	3.667*	0.809	22.067	.25	.	.
24	46	0.11	5	11.660*	0.650	5.574	.	.	.
25	18	2.21	6	11.667*	1.033	8.853	.09	.	.
				"<"					
26	14	16.21	.	0.100					

TABLE NO. 18

RESULTS OF INTERCOMPARISON FOR CR IN IAEA/RUN MA-M-2/TM

UNITS MICROG/G INPUT VALUE .

NO.	LAB. CODE NO.	METH. CODE NO.	NO. OF DETERM.	LAB. MEAN	LAB. STANDARD DEV. ABS	REL %	ESTIM. LAB. ERROR%	DEVIATION FROM INPUT VALUE	R
1	40	0.11	6	0.541	0.067	12.310	19.29	.	.
2	10A	2.22	4	0.701	0.159	22.699	.28	.	.
3	51	0.11	3	0.724	0.020	2.730	10.	.	.
4	1	3.22	6	0.873	0.118	13.464	.09	.	.
5	5	16.21	4	0.875	0.057	6.499	.25	.	.
6	28	3.22	5	0.890	0.078	8.740	.09	.	.
7	17	2.32	6	0.900	0.084	9.296	.11	.	.
8	33	3.32	6	0.952	0.045	4.719	.05	.	.
9	10B	0.22	4	0.952	0.191	20.074	.30	.	.
10	19	0.11	6	1.043	0.155	14.894	.	.	.
11	31	3.22	4	1.167	0.214	18.309	.18	.	.
12	21	0.11	4	1.172	0.086	7.349	8.10	.	.
13	48	0.22	6	1.193	0.082	6.883	.	.	.
14	26A	0.11	6	1.235	0.149	12.051	1.12	.	.
15	22	2.32	3	1.250	0.223	17.871	.18	.	.
16	32	2.21	6	1.267	0.137	10.786	.11	.	.
17	37	0.11	3	1.390	0.115	8.297	6.07	.	.
18	14	16.21	5	1.394	0.187	13.436	.13	.	.
19	52	0.11	6	1.402	0.033	2.363	2.03	.	.
20	43	0.11	4	1.485	0.132	8.874	2.12	.	.
21	41	0.11	6	1.613	0.361	22.375	.21	.	.
22	27	2.22	6	1.700	0.167	9.843	0.10	.	.
23	6	2.22	4	1.830	0.280	15.301	.	.	.
24	26B	3.43	6	1.833	0.288	15.683	.40	.	.
25	3	2.21	6	2.600	0.210	8.068	.09	.	.
26	20	2.21	6	2.692	0.494	18.352	.02	.	.
27	24	2.21	6	2.983	0.223	7.470	.07	.	.
28	46	0.11	6	3.075	1.389	45.164	.	.	.
29	2	16.21	4	3.165	0.017	0.547	.	.	.
30	13B	2.20	1	7.330+	.	.	.	.	.
31	8	2.21	6	19.517*	3.254	16.674	.17	.	.
				"<"					
32	18	2.21	.	5.000					

TABLE NO. 19

RESULTS OF INTERCOMPARISON FOR CS IN IAEA/RUN MA-M-2/TM

UNITS NANOG/G INPUT VALUE .

NO.	LAB. CODE NO.	METH. CODE NO.	NO. OF DETERM.	LAB. MEAN	LAB. STANDARD DEV. ABS	REL %	ESTIM. LAB. ERROR%	DEVIATION FROM INPUT VALUE	R
1	21	0.11	4	75.750	6.850	9.042	15.20	.	.
2	26A	0.11	6	86.833	2.927	3.371	1.10	.	.

TABLE NO. 20

RESULTS OF INTERCOMPARISON FOR CU IN IAEA/RUN MA-M-2/TM

UNITS MICROG/G INPUT VALUE .

NO.	LAB. CODE NO.	METH. CODE NO.	NO. OF DETERM.	LAB. MEAN	LAB. STANDARD DEV. ABS	REL %	ESTIM. LAB. ERROR%	DEVIATION FROM INPUT VALUE	R
1	31	3.32	4	1.660	0.080	4.844	.05	.	.
2	10A	2.22	4	1.810	0.162	8.965	.10	.	.
3	38	7.41	6	3.850	1.046	27.180	.26	.	.
4	13A	18.20	1	4.510	.	.	.	.	.
5	36	2.21	6	4.567	0.939	20.561	.	.	.
6	13B	2.20	1	4.620	.	.	.	.	.
7	48	0.22	6	5.647	0.170	3.011	.	.	.
8	5	16.21	4	6.300	0.424	6.734	.12	.	.
9	17	2.32	6	6.600	0.077	1.174	.04	.	.
10	42	16.32	4	6.835	0.168	2.461	.03	.	.
11	3	2.21	6	7.183	0.417	5.801	.06	.	.
12	33	3.32	6	7.228	1.032	14.271	.14	.	.
13	53	16.70	1	7.510	.	.	.	.	.
14	55	2.22	5	7.538	1.494	19.818	.20	.	.
15	1	3.22	6	7.553	0.299	3.960	.04	.	.
16	34	2.22	6	7.600	0.434	5.705	.06	.	.
17	23	2.22	6	7.700	0.261	3.387	.04	.	.
18	35	2.21	6	7.833	0.638	8.141	.12	.	.
19	27	2.22	6	7.850	0.164	2.093	.02	.	.
20	30	2.22	1	7.960	.	.	.04	.	.
21	47	16.22	4	7.960	0.928	11.655	.12	.	.
22	26B	3.43	6	8.000	0.261	3.260	.12	.	.
23	45	16.32	6	8.000	0.800	10.000	.	.	.
24	10B	0.22	3	8.100	0.843	10.402	.11	.	.
25	6	25.22	4	8.125	0.310	3.810	.	.	.
26	22	2.21	3	8.367	0.643	7.684	.08	.	.
27	32	2.21	6	8.400	0.438	5.216	.05	.	.
28	2	16.21	4	8.440	0.772	9.141	.	.	.
29	54	16.21	1	8.500	.	.	.	.	.
30	9	2.21	6	8.512	0.301	3.533	.04	.	.
31	20	2.21	6	8.617	0.196	2.271	.01	.	.
32	49	2.21	3	8.863	0.131	1.472	.02	.	.
33	28	3.21	5	8.910	0.536	6.017	.06	.	.
34	19	0.12	3	9.007	0.276	3.070	.	.	.
35	16	7.60	6	9.150	2.028	22.159	5.20	.	.
36	14	16.21	5	9.792	1.541	15.733	.15	.	.
37	18	2.21	6	10.000	0.000	0.000	.01	.	.
38	25	2.21	6	10.500	1.049	9.989	.10	.	.
39	44B	36.21	5	11.580	2.051	17.712	.	.	.
40	44A	36.32	4	11.675	2.659	22.773	.	.	.
41	29	16.70	4	13.857	0.243	1.750	.03	.	.
42	8	2.21	6	16.600*	1.770	10.661	.11	.	.
43	24	2.21	6	23.017*	1.890	8.213	.08	.	.
44	51	0.12	3	253.836*	23.243	9.157	2.	.	.
45	37	0.11	3	2611.000*	82.286	3.152	2.03	.	.
				"<"					
46	40	0.11	.	17.000					

TABLE NO. 21

RESULTS OF INTERCOMPARISON FOR EU IN IAEA/RUN MA-M-2/TM

UNITS NANOG/G INPUT VALUE .

NO.	LAB. CODE NO.	METH. CODE NO.	NO. OF DETERM.	LAB. MEAN	LAB. STANDARD DEV. ABS	REL %	ESTIM. LAB. ERROR%	DEVIATION FROM INPUT VALUE	R
1	21	0.11	4	7.750	1.500	19.355	15.20	.	.
2	26A	0.11	6	8.317	0.376	4.526	5.10	.	.
3	43	0.11	4	16.000	1.414	8.839	5.15	.	.

TABLE NO. 22

RESULTS OF INTERCOMPARISON FOR F IN IAEA/RUN MA-M-2/TM

UNITS MICROG/G INPUT VALUE .

NO.	LAB. CODE NO.	METH. CODE NO.	NO. OF DETERM.	LAB. MEAN	LAB. STANDARD DEV. ABS	REL %	ESTIM. LAB. ERROR%	DEVIATION FROM INPUT VALUE	R
1	7	2.90	6	12.083	1.162	9.614	.10	.	.

TABLE NO. 23

RESULTS OF INTERCOMPARISON FOR FE IN IAEA/RUN MA-M-2/TM

UNITS MICROG/G INPUT VALUE .

NO.	LAB. CODE NO.	METH. CODE NO.	NO. OF DETERM.	LAB. MEAN	LAB. STANDARD DEV. ABS	REL %	ESTIM. LAB. ERROR%	DEVIATION FROM INPUT VALUE	R
1	38	7.41	6	84.667*	9.374	11.071	.11	.	.
2	13A	18.20	1	149.870	.	.	.	.	.
3	13B	2.20	1	164.100	.	.	.	.	.
4	17	2.32	6	177.167	3.830	2.162	.03	.	.
5	33	3.32	6	177.167	12.156	6.861	.07	.	.
6	42	16.32	4	195.500	2.646	1.353	.02	.	.
7	25	2.21	6	196.333	7.607	3.875	.05	.	.
8	18	2.21	6	196.667	2.582	1.313	.02	.	.
9	16	7.60	6	202.833	18.862	9.299	3.15	.	.
10	32	2.21	6	207.500	2.739	1.320	.01	.	.
11	40	0.11	6	213.667	37.393	17.501	16.26	.	.
12	5	16.21	4	214.750	0.957	0.446	.07	.	.
13	52	0.11	6	220.333	6.563	2.978	1.03	.	.
14	47	16.22	4	229.200	9.880	4.310	.04	.	.
15	8	2.21	6	235.833	6.306	2.674	.03	.	.
16	15	0.12	6	241.833	6.080	2.514	2.03	.	.
17	3	2.21	5	242.000	10.464	4.324	.04	.	.
18	49	2.21	3	244.667	11.846	4.842	.05	.	.
19	10A	2.21	4	253.400	16.841	6.646	.06	.	.
20	45	16.32	6	253.667	7.062	2.784	.	.	.
21	19	0.11	6	256.167	27.118	10.586	.	.	.
22	28	3.21	5	258.440	11.075	4.285	.04	.	.
23	35	2.21	6	262.450	33.008	12.577	.15	.	.
24	4	2.21	4	263.347	6.054	2.299	.02	.	.
25	31	3.32	6	264.333	11.039	4.176	.04	.	.
26	34	2.22	6	265.833	20.595	7.747	.08	.	.
27	22	2.32	3	267.333	14.503	5.425	.05	.	.
28	41	0.11	6	268.167	14.303	5.334	.05	.	.
29	21	0.11	4	269.750	16.780	6.221	4.05	.	.
30	9	2.21	6	272.833	3.312	1.214	.01	.	.
31	37	0.11	3	273.000	17.578	6.439	2.03	.	.
32	24	2.21	6	273.467	13.331	4.875	.06	.	.
33	26A	0.11	6	275.500	10.483	3.805	1.05	.	.
34	2	16.21	4	276.000	24.454	8.860	.	.	.
35	27	2.21	6	280.500	3.391	1.209	.01	.	.
36	51	0.11	3	281.426	4.279	1.521	5.	.	.
37	26B	3.43	6	281.500	3.391	1.205	.03	.	.
38	20	2.21	6	297.000	8.149	2.744	.01	.	.
39	43	0.11	4	302.350	6.325	2.092	1.12	.	.
40	6	2.21	4	316.750	28.289	8.931	.	.	.

TABLE NO. 24

RESULTS OF INTERCOMPARISON FOR HF IN IAEA/RUN MA-M-2/TM

UNITS NANOG/G INPUT VALUE .

NO.	LAB. CODE NO.	METH. CODE NO.	NO. OF DETERM.	LAB. MEAN	LAB. STANDARD DEV. ABS	REL %	ESTIM. LAB. ERROR%	DEVIATION FROM INPUT VALUE	R
1	26A	0.11	6	13.000	0.894	6.880	7.10	.	.
				"<"					
2	21	0.11	.	50.000					

TABLE NO. 25

RESULTS OF INTERCOMPARISON FOR HG IN IAEA/RUN MA-M-2/TM

UNITS MICROG/G INPUT VALUE .

NO.	LAB. CODE NO.	METH. CODE NO.	NO. OF DETERM.	LAB. MEAN	LAB. STANDARD DEV. ABS	REL %	ESTIM. LAB. ERROR%	DEVIATION FROM INPUT VALUE	R
1	8	24.24	6	0.035*	0.007	19.653	.20	.	.
2	50	24.24	6	0.587	0.027	4.592	.05	.	.
3	54	24.24	1	0.600	.	.	.	.	.
4	32	24.24	6	0.750	0.052	6.902	.20	.	.
5	27	24.23	6	0.802	0.034	4.206	.04	.	.
6	55	24.24	5	0.856	0.054	6.324	.10	.	.
7	26A	0.11	6	0.908	0.053	5.884	4.08	.	.
8	23	24.24	6	0.925	0.021	2.242	.03	.	.
9	15	0.12	6	0.937	0.021	2.205	1.02	.	.
10	14	24.24	5	0.947	0.034	3.588	.04	.	.
11	2	24.24	4	0.962	0.010	0.995	.	.	.
12	26B	3.43	3	0.983	0.045	4.586	.15	.	.
13	18	34.24	6	1.052	0.026	2.510	.03	.	.
14	47	24.24	6	1.056	0.045	4.276	.05	.	.
15	12B	24.24	6	1.057	0.022	2.044	.	.	.
16	12A	24.24	6	1.077	0.098	9.113	.05	.	.
17	48	0.22	6	1.155	0.060	5.159	.	.	.
18	34	34.24	6	1.240	0.048	3.884	.	.	.
19	43	0.11	4	1.317	0.041	3.122	1.15	.	.
20	33	3.32	6	1.805*	0.295	16.333	.16	.	.
21	21	0.11	4	2.450*	0.580	23.683	20.25	.	.
				"<"					
22	17	24.24	.	0.010					
23	22	24.24	.	0.020					

TABLE NO. 26

RESULTS OF INTERCOMPARISON FOR I IN IAEA/RUN MA-M-2/TM

UNITS MICROG/G INPUT VALUE .

NO.	LAB. CODE NO.	METH. CODE NO.	NO. OF DETERM.	LAB. MEAN	LAB. STANDARD DEV. ABS	REL %	ESTIM. LAB. ERROR%	DEVIATION FROM INPUT VALUE	R
1	51	0.11	3	1.533	0.026	1.700	18.	.	.
2	26A	0.11	5	19.000	4.000	21.053	20.25	.	.

TABLE NO. 27

RESULTS OF INTERCOMPARISON FOR K IN IAEA/RUN MA-M-2/TM

UNITS MILIG/G INPUT VALUE .

NO.	LAB. CODE NO.	METH. CODE NO.	NO. OF DETERM.	LAB. MEAN	LAB. STANDARD DEV. ABS	REL %	ESTIM. LAB. ERROR%	DEVIATION FROM INPUT VALUE	R
1	38	7.41	6	8.360	1.431	17.118	.17	.	.
2	16	7.60	6	8.717	0.875	10.039	2.15	.	.
3	40	0.11	6	10.295	2.118	20.572	17.21	.	.
4	42	16.32	4	11.503	0.067	0.584	.01	.	.
5	26A	0.11	6	11.733	1.017	8.669	6.15	.	.
6	26B	3.43	6	12.097	0.434	3.589	.20	.	.
7	52	0.11	6	12.351	0.127	1.029	2.02	.	.
8	10A	2.31	4	13.093	0.448	3.425	.05	.	.
9	22	2.32	3	16.133	0.153	0.947	.01	.	.

TABLE NO. 28

RESULTS OF INTERCOMPARISON FOR LA IN IAEA/RUN MA-M-2/TM

UNITS MICROG/G INPUT VALUE .

NO.	LAB. CODE NO.	METH. CODE NO.	NO. OF DETERM.	LAB. MEAN	LAB. STANDARD DEV. ABS	REL %	ESTIM. LAB. ERROR%	DEVIATION FROM INPUT VALUE	R
1	26A	0.11	6	0.287	0.088	30.861	7.15	.	.
2	21	0.11	4	0.800	0.082	10.206	25.30	.	.

TABLE NO. 29

RESULTS OF INTERCOMPARISON FOR LI IN IAEA/RUN MA-M-2/TM

UNITS MICROG/G INPUT VALUE .

NO.	LAB. CODE NO.	METH. CODE NO.	NO. OF DETERM.	LAB. MEAN	LAB. STANDARD DEV. ABS	REL %	ESTIM. LAB. ERROR%	DEVIATION FROM INPUT VALUE	R
1	24	2.21	6	0.900	0.110	12.172	.12	.	.

TABLE NO. 30

RESULTS OF INTERCOMPARISON FOR MG IN IAEA/RUN MA-M-2/TM

UNITS MILIG/G INPUT VALUE .

NO.	LAB. CODE NO.	METH. CODE NO.	NO. OF DETERM.	LAB. MEAN	LAB. STANDARD DEV. ABS	REL %	ESTIM. LAB. ERROR%	DEVIATION FROM INPUT VALUE	R
1	17	2.32	6	5.226	0.134	2.555	.03	.	.
2	42	16.32	4	5.560	0.044	0.787	.01	.	.
3	31	3.32	6	5.936	0.160	2.693	.03	.	.
4	21	0.11	4	5.945	0.393	6.605	12.15	.	.
5	10A	2.21	5	6.685	0.070	1.041	.03	.	.
6	22	2.32	3	6.700	0.100	1.493	.02	.	.
7	51	0.11	3	10.979*	0.433	3.941	14.	.	.

TABLE NO. 31

RESULTS OF INTERCOMPARISON FOR MN IN IAEA/RUN MA-M-2/1M

UNITS MICROG/G INPUT VALUE .

NO.	LAB. CODE NO.	METH. CODE NO.	NO. OF DETERM.	LAB. MEAN	LAB. STANDARD DEV. ABS	REL %	ESTIM. LAB. ERROR%	DEVIATION FROM INPUT VALUE	R
1	3	2.21	6	13.245*	.3.181	24.016	.26	.	.
2	13B	2.20	1	35.850	.	.	.	.	.
3	16	7.60	6	36.500	2.588	7.092	6.20	.	.
4	13A	18.20	1	38.370	.	.	.	.	.
5	33	3.32	6	49.283	3.060	6.210	.06	.	.
6	17	2.32	6	54.050	1.434	2.652	.03	.	.
7	27	2.22	6	54.250	0.625	1.153	.01	.	.
8	42	16.32	4	55.600	0.668	1.202	.01	.	.
9	52	0.11	6	57.867	2.097	3.624	2.04	.	.
10	32	2.21	6	59.483	0.343	0.577	.01	.	.
11	40	0.11	6	60.533	1.639	2.708	2.06	.	.
12	21	0.11	4	60.750	6.500	10.700	7.09	.	.
13	35	2.21	6	63.267	4.171	6.593	.12	.	.
14	45	16.32	6	65.000	2.094	3.221	.	.	.
15	15	0.11	6	65.833	4.535	6.889	3.07	.	.
16	10A	2.21	5	65.960	2.202	3.338	.06	.	.
17	5	16.21	4	66.425	1.576	2.372	.10	.	.
18	26A	0.11	6	66.783	2.997	4.488	1.08	.	.
19	31	3.32	6	67.392	2.012	2.985	.03	.	.
20	18	2.21	6	67.667	1.033	1.526	.02	.	.
21	4	2.21	4	68.987	1.576	2.285	.02	.	.
22	26B	3.43	6	69.850	0.586	0.838	.05	.	.
23	14	16.21	5	74.042	2.162	2.920	.03	.	.
24	22	2.32	3	74.333	6.110	8.220	.08	.	.
25	2	16.21	4	75.250	2.500	3.322	.	.	.
26	30	2.22	1	75.600	.	.	.02	.	.
27	44A	36.32	5	77.480	8.640	11.151	.	.	.
28	49	2.21	6	77.900	4.710	6.046	.06	.	.
29	37	0.11	3	78.067	0.503	0.645	2.03	.	.
30	9	2.21	6	78.450	5.356	6.827	.07	.	.
31	51	0.11	3	79.829	2.591	3.246	2.	.	.
32	20	2.21	6	80.333	5.046	6.282	.01	.	.
33	44B	36.21	5	81.000	5.568	6.874	.	.	.
34	6	2.21	4	82.650	1.229	1.487	.	.	.
35	24	2.21	6	85.250	4.413	5.177	.05	.	.
36	8	2.21	6	348.667*	36.795	10.553	.11	.	.

TABLE NO. 32

RESULTS OF INTERCOMPARISON FOR MO IN IAEA/RUN MA-M-2/TM

UNITS MICROG/G INPUT VALUE .

NO.	LAB. CODE NO.	METH. CODE NO.	NO. OF DETERM.	LAB. MEAN	LAB. STANDARD DEV. ABS	REL %	ESTIM. LAB. ERROR%	DEVIATION FROM INPUT VALUE	R
1	26B	3.43	3	0.803	0.080	9.984	.20	.	.
2	10A	2.22	4	1.368	0.372	27.167	.34	.	.
3	10B	0.22	4	1.460	0.726	49.748	.67	.	.
4	44A	36.32	4	9.100*	0.735	8.075	.	.	.

TABLE NO. 33

RESULTS OF INTERCOMPARISON FOR NA IN IAEA/RUN MA-M-2/TM

UNITS MILIG/G INPUT VALUE .

NO.	LAB. CODE NO.	METH. CODE NO.	NO. OF DETERM.	LAB. MEAN	LAB. STANDARD DEV. ABS	REL %	ESTIM. LAB. ERROR%	DEVIATION FROM INPUT VALUE	R
1	42	16.32	4	44.035	0.241	0.548	.01	.	.
2	40	0.11	6	44.317	0.549	1.239	1.05	.	.
3	22	2.32	3	44.333	1.557	3.511	.04	.	.
4	26A	0.11	6	45.508	1.450	3.187	1.15	.	.
5	10A	2.31	5	45.584	2.221	4.872	.08	.	.
6	46	0.11	6	46.633	1.035	2.219	.	.	.
7	51	0.11	3	47.681	0.270	0.566	1.	.	.

TABLE NO. 34

RESULTS OF INTERCOMPARISON FOR NI IN IAEA/RUN MA-M-2/TM

UNITS MICROG/G INPUT VALUE .

NO.	LAB. CODE NO.	METH. CODE NO.	NO. OF DETERM.	LAB. MEAN	LAB. STANDARD DEV. ABS	LAB. STANDARD DEV. REL %	ESTIM. LAB. ERROR%	DEVIATION FROM INPUT VALUE	R
1	33	3.32	6	0.782	0.088	11.311	.11	.	.
2	20	2.21	6	0.793	0.148	18.657	.20	.	.
3	22	2.32	3	0.830	0.130	15.663	.16	.	.
4	28	3.22	5	0.890	0.078	8.740	.09	.	.
5	32	2.21	6	1.067	0.137	12.809	.13	.	.
6	26A	0.11	6	1.120	0.200	17.884	10.15	.	.
7	26B	3.43	6	1.202	0.061	5.114	.20	.	.
8	16	7.60	6	1.350	0.501	37.111	8.30	.	.
9	31	3.32	4	1.450	0.227	15.686	.15	.	.
10	14	16.21	4	1.587	0.183	11.539	.12	.	.
11	42	2.32	4	1.615	0.121	7.473	.07	.	.
12	29	16.70	4	1.857	0.028	1.483	.03	.	.
13	8	2.21	6	2.037	0.407	20.002	.20	.	.
14	10A	2.22	3	2.192	0.583	26.609	.30	.	.
15	2	16.21	4	2.215	0.094	4.243	.	.	.
16	10B	0.22	5	2.491	0.339	13.628	.20	.	.
17	5	16.21	4	3.600*	0.141	3.928	.17	.	.
18	35	2.21	6	4.250*	0.592	13.940	.13	.	.
19	13B	2.20	1	6.340*	.	.	.	.	.
20	24	2.21	6	6.547*	1.360	20.776	.23	.	.
21	18	2.21	6	8.500*	0.837	9.843	.10	.	.
22	13A	18.20	1	14.360*	.	.	.	.	.
23	37	0.11	3	111.967*	113.480	101.351	6.07	.	.
				"<"					
24	17	2.32	.	2.000					

TABLE NO. 35

RESULTS OF INTERCOMPARISON FOR P IN IAEA/RUN MA-M-2/TM

UNITS MILIG/G INPUT VALUE .

NO.	LAB. CODE NO.	METH. CODE NO.	NO. OF DETERM.	LAB. MEAN	LAB. STANDARD DEV. ABS	LAB. STANDARD DEV. REL %	ESTIM. LAB. ERROR%	DEVIATION FROM INPUT VALUE	R
1	33	3.32	6	6.640	0.548	8.257	.08	.	.
2	31	3.32	6	8.652	0.082	0.950	.01	.	.

TABLE NO. 36

RESULTS OF INTERCOMPARISON FOR PB IN IAEA/RUN MA-M-2/TM

UNITS MICROG/G INPUT VALUE .

NO.	LAB. CODE NO.	METH. CODE NO.	NO. OF DETERM.	LAB. MEAN	LAB. STANDARD DEV. ABS	LAB. STANDARD DEV. REL %	ESTIM. LAB. ERROR%	DEVIATION FROM INPUT VALUE	R
1	10A	2.22	4	0.095	0.008	8.325	.11	.	.
2	31	3.22	4	0.920	0.101	10.942	.12	.	.
3	48	0.22	6	1.218	0.050	4.068	.	.	.
4	10B	0.22	4	1.222	0.218	17.801	.22	.	.
5	8	2.21	6	1.265	0.182	14.367	.14	.	.
6	47	16.22	4	1.366	0.175	12.795	.13	.	.
7	3	2.21	6	1.367	0.186	13.624	.15	.	.
8	34	2.22	6	1.537	0.126	8.197	.08	.	.
9	28	3.22	5	1.660	0.121	7.316	.08	.	.
10	30	2.22	1	1.760	.	.	.03	.	.
11	2	16.22	4	1.780	0.070	3.919	.	.	.
12	6	25.22	3	1.840	0.225	12.237	.	.	.
13	55	2.22	5	1.882	0.206	10.963	.20	.	.
14	23	2.22	6	1.917	0.147	7.680	.08	.	.
15	49	25.21	6	2.037	0.101	4.946	.05	.	.
16	27	2.22	6	2.067	0.280	13.571	.13	.	.
17	32	2.21	6	2.217	0.256	11.560	.11	.	.
18	54	16.22	1	2.360	.	.	.	.	.
19	26B	3.43	6	2.400	0.110	4.564	.20	.	.
20	38	7.41	1	2.500	.	.	.16	.	.
21	12B	2.70	6	2.717	0.240	8.839	.	.	.
22	14	15.21	5	2.852	0.290	10.151	.10	.	.
23	20	2.21	6	2.883	0.202	7.008	.01	.	.
24	16	7.60	6	3.017	0.479	15.886	6.30	.	.
25	5	16.21	4	3.075	1.204	39.148	.50	.	.
26	53	16.70	1	3.920	.	.	.	.	.
27	29	16.70	4	4.377	0.090	2.046	.02	.	.
28	33	3.32	6	6.870*	0.715	10.410	.10	.	.
29	13A	18.20	1	9.770*	.	.	.	.	.
30	24	2.21	6	13.123*	1.662	12.665	.13	.	.
31	13B	2.20	1	13.920*	.	.	.	.	.
32	18	2.21	6	21.333*	2.251	10.551	.11	.	.
				"<"					
33	22	2.21	.	1.000					
34	17	2.32	.	2.000					

TABLE NO. 37

RESULTS OF INTERCOMPARISON FOR RB IN IAEA/RUN MA-M-2/TM

UNITS MICROG/G INPUT VALUE .

NO.	LAB. CODE NO.	METH. CODE NO.	NO. OF DETERM.	LAB. MEAN	LAB. STANDARD DEV. ABS	REL %	ESTIM. LAB. ERROR%	DEVIATION FROM INPUT VALUE	R
1	52	0.11	6	4.783	0.232	4.843	3.05	.	.
2	19	0.11	6	5.307	0.974	18.353	.	.	.
3	40	0.11	6	5.330	1.018	19.092	12.16	.	.
4	26B	3.43	6	6.200	0.190	3.060	.10	.	.
5	41	0.11	6	6.485	0.546	8.421	.08	.	.
6	43	0.11	4	6.965	0.149	2.138	4.15	.	.
7	21	0.11	4	7.150	0.645	9.028	10.12	.	.
8	26A	0.11	6	7.208	0.174	2.419	1.08	.	.
9	51	0.11	3	7.755	0.012	0.154	21.	.	.
10	16	7.60	6	7.800	7.164	91.840	12.35	.	.
11	38	7.41	6	9.267	1.232	13.299	.13	.	.

TABLE NO. 38

RESULTS OF INTERCOMPARISON FOR S IN IAEA/RUN MA-M-2/TM

UNITS MILIG/G INPUT VALUE .

NO.	LAB. CODE NO.	METH. CODE NO.	NO. OF DETERM.	LAB. MEAN	LAB. STANDARD DEV. ABS	REL %	ESTIM. LAB. ERROR%	DEVIATION FROM INPUT VALUE	R
1	38	7.41	6	15.597	1.687	10.813	.11	.	.
2	26B	3.43	6	19.372	0.218	1.124	.20	.	.
3	31	3.32	6	20.256	0.303	1.498	.02	.	.
4	16	7.60	6	25.667	3.077	11.988	3.20	.	.

TABLE NO. 39

RESULTS OF INTERCOMPARISON FOR SB IN IAEA/RUN MA-M-2/TM

UNITS NANOG/G INPUT VALUE .

NO.	LAB. CODE NO.	METH. CODE NO.	NO. OF DETERM.	LAB. MEAN	LAB. STANDARD DEV. ABS	REL %	ESTIM. LAB. ERROR%	DEVIATION FROM INPUT VALUE	R
1	26A	0.11	6	26.667	3.327	12.475	3.20	.	.
2	43	0.11	4	27.000	2.449	9.072	11.25	.	.
3	21	0.11	4	29.500	4.933	16.722	40.45	.	.
4	15	0.12	5	52.000*	8.367	16.090	7.16	.	.
5	37	0.11	2	120.000*	0.000	0.000	17.18	.	.
6	10A	2.22	3	6075.333*	1012.53	16.666	.18	.	.
				"<"					
7	17	2.32	.	4000					

TABLE NO. 40

RESULTS OF INTERCOMPARISON FOR SC IN IAEA/RUN MA-M-2/TM

UNITS NANOG/G INPUT VALUE .

NO.	LAB. CODE NO.	METH. CODE NO.	NO. OF DETERM.	LAB. MEAN	LAB. STANDARD DEV. ABS	REL %	ESTIM. LAB. ERROR%	DEVIATION FROM INPUT VALUE	R
1	43	0.11	4	34.750*	1.258	3.621	1.15	.	.
2	21	0.11	4	42.250	1.500	3.550	4.05	.	.
3	26A	0.11	6	44.333	3.670	8.278	1.10	.	.
4	41	0.11	6	45.850	1.520	3.316	.03	.	.
5	51	0.11	3	48.000	0.200	0.417	8.	.	.

TABLE NO. 41

RESULTS OF INTERCOMPARISON FOR SE IN IAEA/RUN MA-M-2/TM

UNITS MICROG/G INPUT VALUE .

NO.	LAB. CODE NO.	METH. CODE NO.	NO. OF DETERM.	LAB. MEAN	LAB. STANDARD DEV. ABS	REL %	ESTIM. LAB. ERROR%	DEVIATION FROM INPUT VALUE	R
1	52	0.11	6	1.612	0.081	5.047	3.05	.	.
2	40	0.11	6	1.638	0.302	18.443	7.32	.	.
3	1	24.23	5	1.690	0.160	9.477	.10	.	.
4	34	2.22	6	1.700	0.261	15.339	.15	.	.
5	21	0.11	4	2.002	0.095	4.727	3.05	.	.
6	9	2.22	6	2.070	0.090	4.332	.04	.	.
7	26B	3.43	6	2.137	0.155	7.273	.15	.	.
8	39	2.50	6	2.242	0.169	7.546	.05	.	.
9	15	0.12	6	2.290	0.135	5.885	1.06	.	.
10	19	0.11	6	2.313	0.242	10.474	.	.	.
11	51	0.11	3	2.323	0.033	1.402	15.	.	.
12	43	0.11	4	2.335	0.073	3.137	1.15	.	.
13	26A	0.11	5	2.560	0.055	2.140	1.08	.	.
14	33	3.32	6	2.633	0.318	12.058	.10	.	.
15	16	7.60	6	2.700	0.456	16.891	7.25	.	.
16	37	0.11	3	2.833	0.142	5.020	5.06	.	.
17	8	24.23	6	13.240*	4.109	31.033	.31	.	.
18	40	0.11	6	19.667*	1.972	10.030	7.13	.	.

TABLE NO. 42

RESULTS OF INTERCOMPARISON FOR SR IN IAEA/RUN MA-M-2/TM

UNITS MICROG/G INPUT VALUE .

NO.	LAB. CODE NO.	METH. CODE NO.	NO. OF DETERM.	LAB. MEAN	LAB. STANDARD DEV. ABS	REL %	ESTIM. LAB. ERROR%	DEVIATION FROM INPUT VALUE	R
1	24	2.21	6	43.800*	5.522	12.608	.13	.	.
2	17	2.32	6	74.267*	1.504	2.025	.02	.	.
3	44A	36.32	4	91.500	2.606	2.849	.	.	.
4	31	3.32	6	94.450	3.419	3.620	.04	.	.
5	26B	3.43	6	97.033	2.353	2.425	.08	.	.
6	38	7.41	1	101.000	.	.	.05	.	.
7	22	2.32	3	101.667	7.024	6.909	.07	.	.
8	21	0.11	4	104.000	6.481	6.231	20.25	.	.
9	16	7.60	6	106.167	13.571	12.783	4.20	.	.
10	26A	0.11	6	106.667	2.805	2.629	1.15	.	.

TABLE NO. 43

RESULTS OF INTERCOMPARISON FOR TA IN IAEA/RUN MA-M-2/TM

UNITS NANOG/G INPUT VALUE .

NO.	LAB. CODE NO.	METH. CODE NO.	NO. OF DETERM.	LAB. MEAN	LAB. STANDARD DEV. ABS	REL %	ESTIM. LAB. ERROR%	DEVIATION FROM INPUT VALUE	R
1	26A	0.11	6	4.917	1.574	32.015	8.15	.	.

TABLE NO. 44

RESULTS OF INTERCOMPARISON FOR TB IN IAEA/RUN MA-M-2/TM

UNITS NANOG/G INPUT VALUE .

NO.	LAB. CODE NO.	METH. CODE NO.	NO. OF DETERM.	LAB. MEAN	LAB. STANDARD DEV. ABS	REL %	ESTIM. LAB. ERROR%	DEVIATION FROM INPUT VALUE	R
1	26A	0.11	6	6.517	1.698	26.049	8.25	.	.

TABLE NO. 45

RESULTS OF INTERCOMPARISON FOR TE IN IAEA/RUN MA-M-2/TM

UNITS MICROG/G INPUT VALUE .

NO.	LAB. CODE NO.	METH. CODE NO.	NO. OF DETERM.	LAB. MEAN	LAB. STANDARD DEV. ABS	REL %	ESTIM. LAB. ERROR%	DEVIATION FROM INPUT VALUE	R
1	21	0.11	4	1.550	0.742	47.846	20.25	.	.

TABLE NO. 46

RESULTS OF INTERCOMPARISON FOR TH IN IAEA/RUN MA-M-2/TM

UNITS NANOG/G INPUT VALUE .

NO.	LAB. CODE NO.	METH. CODE NO.	NO. OF DETERM.	LAB. MEAN	LAB. STANDARD DEV. ABS	REL %	ESTIM. LAB. ERROR%	DEVIATION FROM INPUT VALUE	R
1	21	0.11	4	45.000	11.576	25.724	15.20	.	.
2	26A	0.11	6	83.333	47.395	56.874	1.10	.	.

TABLE NO. 47

RESULTS OF INTERCOMPARISON FOR TI IN IAEA/RUN MA-M-2/TM

UNITS MICROG/G INPUT VALUE .

NO.	LAB. CODE NO.	METH. CODE NO.	NO. OF DETERM.	LAB. MEAN	LAB. STANDARD DEV. ABS	REL %	ESTIM. LAB. ERROR%	DEVIATION FROM INPUT VALUE	R
1	17	2.32	6	1.408	0.139	9.894	.16	.	.
2	44A	36.32	4	1.900	0.200	10.526	.	.	.

TABLE NO. 48

RESULTS OF INTERCOMPARISON FOR TL IN IAEA/RUN MA-M-2/TM

UNITS MICROG/G INPUT VALUE .

NO.	LAB. CODE NO.	METH. CODE NO.	NO. OF DETERM.	LAB. MEAN	LAB. STANDARD DEV. ABS	REL %	ESTIM. LAB. ERROR%	DEVIATION FROM INPUT VALUE	R
				"<"					
1	1	3.22	.	0.010					

TABLE NO. 49

RESULTS OF INTERCOMPARISON FOR U IN IAEA/RUN MA-M-2/TM

UNITS MICROG/G INPUT VALUE .

NO.	LAB. CODE NO.	METH. CODE NO.	NO. OF DETERM.	LAB. MEAN	LAB. STANDARD DEV. ABS	REL %	ESTIM. LAB. ERROR%	DEVIATION FROM INPUT VALUE	R
1	26A	0.11	6	0.193	0.028	14.507	10.15	.	.

TABLE NO. 50

RESULTS OF INTERCOMPARISON FOR V IN IAEA/RUN MA-M-2/TM

UNITS MICROG/G INPUT VALUE .

NO.	LAB. CODE NO.	METH. CODE NO.	NO. OF DETERM.	LAB. MEAN	LAB. STANDARD DEV. ABS	REL %	ESTIM. LAB. ERROR%	DEVIATION FROM INPUT VALUE	R
1	33	3.32	6	0.840	0.052	6.163	.06	.	.
2	51	0.11	3	1.153	0.043	3.687	20.	.	.
3	40	0.11	3	1.270	0.197	15.510	39.48	.	.
4	10A	2.22	3	1.676	0.276	16.469	.17	.	.
5	22	2.32	3	1.833	0.208	11.355	.11	.	.
6	26B	3.43	6	2.183	0.248	11.374	.40	.	.
7	21	0.11	4	3.600'	1.445	40.126	30.35	.	.
8	10B	0.22	4	7.885'	1.657	21.008	.29	.	.
				"<"					
9	17	2.32	.	0.800					
10	26A	0.11	.	3.000					

TABLE NO. 51

RESULTS OF INTERCOMPARISON FOR ZN IN IAEA/RUN MA-M-2/1M

UNITS MICROG/G INPUT VALUE .

NO.	LAB. CODE NO.	METH. CODE NO.	NO. OF DETERM.	LAB. MEAN	LAB. STANDARD DEV. ABS	REL %	ESTIM. LAB. ERROR%	DEVIATION FROM INPUT VALUE	R
1	46	0.11	6	6.633*	0.266	4.008	.	.	.
2	38	7.41	6	95.283*	4.403	4.621	.05	.	.
3	13B	2.20	1	112.230	.	.	.	.	.
4	33	3.32	6	126.667	2.160	1.705	.02	.	.
5	16	7.60	6	130.167	19.312	14.837	3.15	.	.
6	42	16.32	4	137.750	2.217	1.610	.02	.	.
7	27	2.21	6	140.167	1.472	1.050	.01	.	.
8	36	2.21	6	144.550	14.289	9.885	.	.	.
9	45	16.32	6	145.500	7.868	5.407	.	.	.
10	5	16.21	4	147.500	4.655	3.156	.13	.	.
11	31	3.32	6	149.000	4.050	2.718	.03	.	.
12	40	0.11	6	149.333	12.517	8.382	2.09	.	.
13	17	2.32	6	151.750	7.468	4.921	.05	.	.
14	21	0.11	4	152.250	2.754	1.809	5.06	.	.
15	39	2.21	6	152.333	5.046	3.313	.03	.	.
16	15	0.12	6	152.833	4.215	2.758	1.03	.	.
17	18	2.21	6	153.333	6.121	3.992	.04	.	.
18	8	2.21	6	154.333	2.805	1.817	.02	.	.
19	19	0.11	6	154.833	12.983	8.385	.	.	.
20	43	0.11	4	155.425	1.539	0.990	1.10	.	.
21	20	2.21	6	155.667	4.033	2.591	.01	.	.
22	35	2.21	6	156.333	16.215	10.372	.12	.	.
23	26A	0.11	6	156.667	7.528	4.805	1.08	.	.
24	41	0.11	6	161.000	1.265	0.786	.01	.	.
25	13A	18.20	1	162.920	.	.	.	.	.
26	22	2.32	3	164.000	3.000	1.829	.02	.	.
27	37	0.11	3	164.000	2.646	1.613	2.03	.	.
28	32	2.21	6	164.500	4.461	2.712	.03	.	.
29	51	0.12	3	166.610	0.616	0.370	2.	.	.
30	14	16.21	4	167.902	0.845	0.503	.01	.	.
31	26B	3.43	6	169.050	0.925	0.547	.03	.	.
32	34	2.22	6	170.000	6.325	3.720	.04	.	.
33	48	0.22	6	174.667	15.706	8.992	.	.	.
34	2	16.21	4	178.000	2.160	1.214	.	.	.
35	6	2.21	4	180.500	5.066	2.807	.	.	.
36	25	2.21	6	181.500	3.082	1.698	.05	.	.
37	49	2.21	6	183.000	3.225	1.762	.02	.	.
38	30	2.21	1	184.400	.	.	.02	.	.
39	52	0.11	6	184.667	4.844	2.623	1.03	.	.
40	1	3.21	6	184.833	5.382	2.912	.03	.	.
41	9	2.21	6	186.000	2.449	1.317	.01	.	.
42	3	2.21	6	188.167	4.446	2.363	.02	.	.
43	28	3.21	5	219.420*	12.641	5.761	.05	.	.
44	10A	2.21	4	240.600*	14.883	6.186	.08	.	.
45	24	2.21	6	246.750*	9.600	3.890	.04	.	.
46	29	16.70	4	290.575*	3.224	1.109	.01	.	.
47	4	2.21	3	406.760*	70.181	17.254	.17	.	.
48	47	16.22	4	514.000*	12.675	2.466	.03	.	.

TABLE NO. 52

SUMMARY OF THE RESULTS OF THE INTERCOMPARISON IAEA/RUN MA-M-2/TM

ELEMENTS DETERMINED		AG	AL	AS	AU	B
UNIT		NANOG/G	MICROG/G	MICROG/G	NANOG/G	MICROG/G
INPUT VALUE		.	.	.	.	.
NUMBER OF REPORTED RESULTS	LABORATORY MEANS	8	7	16	4	2
	INDIVIDUAL DETERMINATIONS	37	34	81	22	10
NUMBER OF ACCEPTED RESULTS	LABORATORY MEANS	5	7	13	3	2
	INDIVIDUAL DETERMINATIONS	26	34	69	16	10
TOTAL RANGE OF LABORATORY MEANS		24.025 - 394.500	58.583 - 359.167	0.566 - 15.250	14.433 - 42.500	26.500 - 30.475
RANGE OF ACCEPTED LABORATORY MEANS		45.167 - 61.917	58.583 - 359.167	10.025 - 15.250	14.433 - 16.217	26.500 - 30.475
PERCENTAGE OF OUTLYING LABORATORIES		38	0	19	25	0
PERCENTAGE OF LABORATORIES WITH THE R VALUE > 1		.	.	.	.	.
PERCENTAGE OF LABORATORIES WITH NO R VALUE		.	.	.	.	.
OVERALL MEAN OF ACCEPTED LABORATORY MEANS		53.020	203.279	12.815	15.383	28.487
CONFIDENCE LIMITS OF THE OVERALL MEAN AT .05 SIGN. LEVEL		44.094 - 61.946	105.977 - 300.581	11.932 - 13.699	13.154 - 17.613	-
OVERALL MEDIAN OF ACCEPTED LABORATORY MEANS		54.167	194.000	12.850	15.500	28.487
CONFIDENCE LIMITS OF THE OVERALL MEDIAN AT .05 SIGN. LEVEL		45.167 - 61.917	58.583 - 359.167	11.817 - 14.360	14.433 - 16.217	-
OVERALL MODE OF ACCEPTED LABORATORY MEANS		52.672	188.901	12.847	15.383	.
RELATIVE DEVIATION % FROM THE INPUT VALUE	MEAN	.	.	.	.	.
	MEDIAN	.	.	.	.	.
	MODE	.	.	.	.	.

TABLE NO. 52 (CONTINUED)

SUMMARY OF THE RESULTS OF THE INTERCOMPARISON IAEA/RUN MA-M-2/TM

ELEMENTS DETERMINED		BA	BR	CA	CD	CE
UNIT		MICROG/G	MICROG/G	MILIG/G	MICROG/G	MICROG/G
INPUT VALUE		.	.	.	.	.
NUMBER OF REPORTED RESULTS	LABORATORY MEANS	2	6	8	38	2
	INDIVIDUAL DETERMINATIONS	12	31	39	179	10
NUMBER OF ACCEPTED RESULTS	LABORATORY MEANS	2	6	7	36	2
	INDIVIDUAL DETERMINATIONS	12	31	33	171	10
TOTAL RANGE OF LABORATORY MEANS		0.720 - 1.547	304.167 - 416.667	10.450 - 16.067	0.260 - 6.225	0.352 - 0.667
RANGE OF ACCEPTED LABORATORY MEANS		0.720 - 1.547	304.167 - 416.667	13.684 - 16.067	0.260 - 2.433	0.352 - 0.667
PERCENTAGE OF OUTLYING LABORATORIES		0	0	13	5	0
PERCENTAGE OF LABORATORIES WITH THE R VALUE > 1		.	.	.	.	.
PERCENTAGE OF LABORATORIES WITH NO R VALUE		.	.	.	.	.
OVERALL MEAN OF ACCEPTED LABORATORY MEANS		1.133	353.125	14.797	1.286	0.510
CONFIDENCE LIMITS OF THE OVERALL MEAN AT .05 SIGN. LEVEL		-	310.512 - 395.738	13.990 - 15.603	1.119 - 1.453	-
OVERALL MEDIAN OF ACCEPTED LABORATORY MEANS		1.133	357.792	14.800	1.323	0.510
CONFIDENCE LIMITS OF THE OVERALL MEDIAN AT .05 SIGN. LEVEL		-	304.167 - 416.667	13.684 - 16.067	1.167 - 1.533	-
OVERALL MODE OF ACCEPTED LABORATORY MEANS		.	343.206	14.898	1.308	.
RELATIVE DEVIATION % FROM THE INPUT VALUE	MEAN	.	.	.	.	.
	MEDIAN	.	.	.	.	.
	MODE	.	.	.	.	.

TABLE NO. 52 (CONTINUED)

SUMMARY OF THE RESULTS OF THE INTERCOMPARISON IAEA/RUN MA-M-2/TM

ELEMENTS DETERMINED		CL	CO	CR	CS	CU
UNIT		MILIG/G	MICROG/G	MICROG/G	NANOG/G	MICROG/G
INPUT VALUE		.	.	.	.	.
NUMBER OF REPORTED RESULTS	LABORATORY MEANS	5	25	31	2	45
	INDIVIDUAL DETERMINATIONS	27	114	154	10	205
NUMBER OF ACCEPTED RESULTS	LABORATORY MEANS	3	19	29	2	41
	INDIVIDUAL DETERMINATIONS	18	82	147	10	187
TOTAL RANGE OF LABORATORY MEANS		53.328 - 87.833	0.170 - 11.667	0.541 - 19.517	75.750 - 86.833	1.660 - 2611.000
RANGE OF ACCEPTED LABORATORY MEANS		83.400 - 87.833	0.170 - 1.410	0.541 - 3.165	75.750 - 86.833	1.660 - 13.857
PERCENTAGE OF OUTLYING LABORATORIES		40	24	6	0	9
PERCENTAGE OF LABORATORIES WITH THE R VALUE > 1		.	.	.	.	.
PERCENTAGE OF LABORATORIES WITH NO R VALUE		.	.	.	.	.
OVERALL MEAN OF ACCEPTED LABORATORY MEANS		86.100	0.872	1.479	81.292	7.725
CONFIDENCE LIMITS OF THE OVERALL MEAN AT .05 SIGN. LEVEL		80.214 - 91.986	0.733 - 1.010	1.198 - 1.761	-	6.982 - 8.467
OVERALL MEDIAN OF ACCEPTED LABORATORY MEANS		87.067	0.882	1.250	81.292	7.960
CONFIDENCE LIMITS OF THE OVERALL MEDIAN AT .05 SIGN. LEVEL		83.400 - 87.833	0.757 - 1.067	0.952 - 1.613	-	7.538 - 8.440
OVERALL MODE OF ACCEPTED LABORATORY MEANS		86.100	0.869	1.115	.	8.001
RELATIVE DEVIATION % FROM THE INPUT VALUE	MEAN	.	.	.	.	.
	MEDIAN	.	.	.	.	.
	MODE	.	.	.	.	.

TABLE NO. 52 (CONTINUED)

SUMMARY OF THE RESULTS OF THE INTERCOMPARISON IAEA/RUN MA-M-2/TM

ELEMENTS DETERMINED		EU	F	FE	HF	HG
UNIT		NANOG/G	MICROG/G	MICROG/G	NANOG/G	MICROG/G
INPUT VALUE		.	.	.	.	.
NUMBER OF REPORTED RESULTS	LABORATORY MEANS	3	1	40	1	21
	INDIVIDUAL DETERMINATIONS	14	6	198	6	110
NUMBER OF ACCEPTED RESULTS	LABORATORY MEANS	3	1	39	1	18
	INDIVIDUAL DETERMINATIONS	14	6	192	6	94
TOTAL RANGE OF LABORATORY MEANS		7.750 - 16.000	12.083 - 12.083	84.667 - 316.750	13.000 - 13.000	0.035 - 2.450
RANGE OF ACCEPTED LABORATORY MEANS		7.750 - 16.000	12.083 - 12.083	149.870 - 316.750	13.000 - 13.000	0.587 - 1.317
PERCENTAGE OF OUTLYING LABORATORIES		0	0	3	0	14
PERCENTAGE OF LABORATORIES WITH THE R VALUE > 1		.	.	.	.	.
PERCENTAGE OF LABORATORIES WITH NO R VALUE		.	.	.	.	.
OVERALL MEAN OF ACCEPTED LABORATORY MEANS		10.689	12.083	244.170	13.000	0.956
CONFIDENCE LIMITS OF THE OVERALL MEAN AT .05 SIGN. LEVEL		0.000 - 22.136	-	231.200 - 257.140	-	0.860 - 1.053
OVERALL MEDIAN OF ACCEPTED LABORATORY MEANS		8.317	12.083	256.167	13.000	0.955
CONFIDENCE LIMITS OF THE OVERALL MEDIAN AT .05 SIGN. LEVEL		7.750 - 16.000	-	229.200 - 268.167	-	0.856 - 1.057
OVERALL MODE OF ACCEPTED LABORATORY MEANS		10.689	.	268.658	.	0.950
RELATIVE DEVIATION % FROM THE INPUT VALUE	MEAN	.	.	.	.	.
	MEDIAN	.	.	.	.	.
	MODE	.	.	.	.	.

TABLE NO. 52 (CONTINUED)

SUMMARY OF THE RESULTS OF THE INTERCOMPARISON IAEA/RUN MA-M-2/1M

ELEMENTS DETERMINED		I	K	LA	LI	MG
UNIT		MICROG/G	MILIG/G	MICROG/G	MICROG/G	MILIG/G
INPUT VALUE		.	.	.	.	.
NUMBER OF REPORTED RESULTS	LABORATORY MEANS	2	9	2	1	7
	INDIVIDUAL DETERMINATIONS	8	47	10	6	31
NUMBER OF ACCEPTED RESULTS	LABORATORY MEANS	2	9	2	1	6
	INDIVIDUAL DETERMINATIONS	8	47	10	6	28
TOTAL RANGE OF LABORATORY MEANS		1.533 - 19.000	8.360 - 16.133	0.287 - 0.800	0.900 - 0.900	5.226 - 10.979
RANGE OF ACCEPTED LABORATORY MEANS		1.533 - 19.000	8.360 - 16.133	0.287 - 0.800	0.900 - 0.900	5.226 - 6.700
PERCENTAGE OF OUTLYING LABORATORIES		0	0	0	0	14
PERCENTAGE OF LABORATORIES WITH THE R VALUE > 1		.	.	.	.	.
PERCENTAGE OF LABORATORIES WITH NO R VALUE		.	.	.	.	.
OVERALL MEAN OF ACCEPTED LABORATORY MEANS		10.266	11.587	0.543	0.900	6.009
CONFIDENCE LIMITS OF THE OVERALL MEAN AT .05 SIGN. LEVEL		-	9.782 - 13.392	-	-	5.386 - 6.631
OVERALL MEDIAN OF ACCEPTED LABORATORY MEANS		10.266	11.733	0.543	0.900	5.941
CONFIDENCE LIMITS OF THE OVERALL MEDIAN AT .05 SIGN. LEVEL		-	8.717 - 13.093	-	-	5.226 - 6.700
OVERALL MODE OF ACCEPTED LABORATORY MEANS		.	11.778	.	.	6.189
RELATIVE DEVIATION % FROM THE INPUT VALUE	MEAN	.	.	.	.	.
	MEDIAN	.	.	.	.	.
	MODE	.	.	.	.	.

TABLE NO. 52 (CONTINUED)

SUMMARY OF THE RESULTS OF THE INTERCOMPARISON IAEA/RUN MA-M-2/TM

ELEMENTS DETERMINED		MN	MO	NA	NI	P
UNIT		MICROG/G	MICROG/G	MILIG/G	MICROG/G	MILIG/G
INPUT VALUE		.	.	.	.	.
NUMBER OF REPORTED RESULTS	LABORATORY MEANS	36	4	7	23	2
	INDIVIDUAL DETERMINATIONS	176	15	33	105	12
NUMBER OF ACCEPTED RESULTS	LABORATORY MEANS	34	3	7	16	2
	INDIVIDUAL DETERMINATIONS	164	11	33	78	12
TOTAL RANGE OF LABORATORY MEANS		13.245 - 348.667	0.803 - 9.100	44.035 - 47.681	0,782 - 111.967	6.640 - 8.652
RANGE OF ACCEPTED LABORATORY MEANS		35.850 - 85.250	0.803 - 1.460	44.035 - 47.681	0.782 - 2.491	6.640 - 8.652
PERCENTAGE OF OUTLYING LABORATORIES		6	25	0	30	0
PERCENTAGE OF LABORATORIES WITH THE R VALUE > 1		.	.	.	.	.
PERCENTAGE OF LABORATORIES WITH NO R VALUE		.	.	.	.	.
OVERALL MEAN OF ACCEPTED LABORATORY MEANS		66.173	1.211	45.442	1.467	7.646
CONFIDENCE LIMITS OF THE OVERALL MEAN AT .05 SIGN. LEVEL		61.640 - 70.706	0.327 - 2.094	44.193 - 46.690	1.170 - 1.765	-
OVERALL MEDIAN OF ACCEPTED LABORATORY MEANS		67.087	1.368	45.508	1.400	7.646
CONFIDENCE LIMITS OF THE OVERALL MEDIAN AT .05 SIGN. LEVEL		60.750 - 75.250	0.803 - 1.460	44.035 - 47.681	0.890 - 2.037	-
OVERALL MODE OF ACCEPTED LABORATORY MEANS		66.892	1.211	44.719	0.856	.
RELATIVE DEVIATION % FROM THE INPUT VALUE	MEAN	.	.	.	.	.
	MEDIAN	.	.	.	.	.
	MODE	.	.	.	.	.

TABLE NO. 52 (CONTINUED)

SUMMARY OF THE RESULTS OF THE INTERCOMPARISON IAEA/RUN MA-M-2/TM

ELEMENTS DETERMINED		PB	RB	S	SB	SC
UNIT		MICROG/G	MICROG/G	MILIG/G	NANOG/G	NANOG/G
INPUT VALUE		.	.	.	.	.
NUMBER OF REPORTED RESULTS	LABORATORY MEANS	32	11	4	6	5
	INDIVIDUAL DETERMINATIONS	142	59	24	24	23
NUMBER OF ACCEPTED RESULTS	LABORATORY MEANS	27	11	4	3	4
	INDIVIDUAL DETERMINATIONS	122	59	24	14	19
TOTAL RANGE OF LABORATORY MEANS		0.095 - 21.333	4.783 - 9.267	15.597 - 25.667	26.667 - 6075.333	34.750 - 48.000
RANGE OF ACCEPTED LABORATORY MEANS		0.095 - 4.377	4.783 - 9.267	15.597 - 25.667	26.667 - 29.500	42.250 - 48.000
PERCENTAGE OF OUTLYING LABORATORIES		16	0	0	50	20
PERCENTAGE OF LABORATORIES WITH THE R VALUE > 1		.	.	.	.	.
PERCENTAGE OF LABORATORIES WITH NO R VALUE		.	.	.	.	.
OVERALL MEAN OF ACCEPTED LABORATORY MEANS		2.083	6.750	20.223	27.722	45.108
CONFIDENCE LIMITS OF THE OVERALL MEAN AT .05 SIGN. LEVEL		1.721 - 2.445	5.869 - 7.631	13.613 - 26.832	23.875 - 31.569	41.245 - 48.971
OVERALL MEDIAN OF ACCEPTED LABORATORY MEANS		1.917	6.965	19.814	27.000	45.092
CONFIDENCE LIMITS OF THE OVERALL MEDIAN AT .05 SIGN. LEVEL		1.537 - 2.500	5.307 - 7.800	15.597 - 25.667	26.667 - 29.500	42.250 - 48.000
OVERALL MODE OF ACCEPTED LABORATORY MEANS		1.836	7.108	18.408	27.722	44.144
RELATIVE DEVIATION % FROM THE INPUT VALUE	MEAN	.	.	.	.	.
	MEDIAN	.	.	.	.	.
	MODE	.	.	.	.	.

TABLE NO. 52 (CONTINUED)

SUMMARY OF THE RESULTS OF THE INTERCOMPARISON IAEA/RUN MA-M-2/TM

ELEMENTS DETERMINED		SE	SR	TA	TB	TE
UNIT		MICROG/G	MICROG/G	NANOG/G	NANOG/G	MICROG/G
INPUT VALUE		.	.	.	.	.
NUMBER OF REPORTED RESULTS	LABORATORY MEANS	18	10	1	1	1
	INDIVIDUAL DETERMINATIONS	96	48	6	6	4
NUMBER OF ACCEPTED RESULTS	LABORATORY MEANS	16	8	1	1	1
	INDIVIDUAL DETERMINATIONS	84	36	6	6	4
TOTAL RANGE OF LABORATORY MEANS		1.612 - 19.667	43.800 - 106.667	4.917 - 4.917	6.517 - 6.517	1.550 - 1.550
RANGE OF ACCEPTED LABORATORY MEANS		1.612 - 2.833	91.500 - 106.667	4.917 - 4.917	6.517 - 6.517	1.550 - 1.550
PERCENTAGE OF OUTLYING LABORATORIES		11	20	0	0	0
PERCENTAGE OF LABORATORIES WITH THE R VALUE > 1		.	.	.	.	.
PERCENTAGE OF LABORATORIES WITH NO R VALUE		.	.	.	.	.
OVERALL MEAN OF ACCEPTED LABORATORY MEANS		2.192	100.310	4.917	6.517	1.550
CONFIDENCE LIMITS OF THE OVERALL MEAN AT .05 SIGN. LEVEL		1.986 - 2.399	95.695 - 104.926	-	-	-
OVERALL MEDIAN OF ACCEPTED LABORATORY MEANS		2.266	101.333	4.917	6.517	1.550
CONFIDENCE LIMITS OF THE OVERALL MEDIAN AT .05 SIGN. LEVEL		1.700 - 2.560	91.500 - 106.667	-	-	-
OVERALL MODE OF ACCEPTED LABORATORY MEANS		2.305	103.944	.	.	.
RELATIVE DEVIATION % FROM THE INPUT VALUE	MEAN	.	.	.	.	.
	MEDIAN	.	.	.	.	.
	MODE	.	.	.	.	.

TABLE NO. 52 (CONTINUED)

SUMMARY OF THE RESULTS OF THE INTERCOMPARISON IAEA/RUN MA-M-2/TM

ELEMENTS DETERMINED		TH	TI	U	V	ZN
UNIT		NANOG/G	MICROG/G	MICROG/G	MICROG/G	MICROG/G
INPUT VALUE		.	.	.	.	.
NUMBER OF REPORTED RESULTS	LABORATORY MEANS	2	2	1	8	48
	INDIVIDUAL DETERMINATIONS	10	10	6	32	240
NUMBER OF ACCEPTED RESULTS	LABORATORY MEANS	2	2	1	6	40
	INDIVIDUAL DETERMINATIONS	10	10	6	24	202
TOTAL RANGE OF LABORATORY MEANS		45.000 - 83.333	1.408 - 1.900	0.193 - 0.193	0.840 - 7.885	6.633 - 514.000
RANGE OF ACCEPTED LABORATORY MEANS		45.000 - 83.333	1.408 - 1.900	0.193 - 0.193	0.840 - 2.183	112.230 - 188.167
PERCENTAGE OF OUTLYING LABORATORIES		0	0	0	25	17
PERCENTAGE OF LABORATORIES WITH THE R VALUE > 1		.	.	.	.	.
PERCENTAGE OF LABORATORIES WITH NO R VALUE		.	.	.	.	.
OVERALL MEAN OF ACCEPTED LABORATORY MEANS		64.167	1.654	0.193	1.493	159.858
CONFIDENCE LIMITS OF THE OVERALL MEAN AT .05 SIGN. LEVEL		-	-	-	0.975 - 2.011	154.247 - 165.470
OVERALL MEDIAN OF ACCEPTED LABORATORY MEANS		64.167	1.654	0.193	1.473	156.500
CONFIDENCE LIMITS OF THE OVERALL MEDIAN AT .05 SIGN. LEVEL		-	-	-	0.840 - 2.183	152.833 - 166.610
OVERALL MODE OF ACCEPTED LABORATORY MEANS		.	.	.	1.366	154.150
RELATIVE DEVIATION % FROM THE INPUT VALUE	MEAN	.	.	.	.	.
	MEDIAN	.	.	.	.	.
	MODE	.	.	.	.	.

TABLE NO. 53

COMPARISON OF THE OVERALL MEANS WITH THE MEAN VALUES OBTAINED BY VARIOUS ANALYTICAL METHODS IN INTERCOMPARISON IAEA/RUN MA-M-2/TM

ELEMENT	NUMBER OF ACCEPTED RESULTS	PERCENTAGE OF OUTLIERS (%)	UNIT	OVERALL VALUE	OVERALL CONFIDENCE LIMITS (0.05)	MEAN RELATIVE UNCERTAINTY (%)	ANALYTICAL METHODS USED CODE NO.	ABBREV.	OBTAINED BY THE METHOD MEAN VALUE	NUMBER OF ACCEPTED RESULTS	NUMBER OF OUTLIERS
AG	5	38	NANOG/G	53.02	44.09 - 61.95	+-17	.1	NAA	54.86	3	1
							.2	AAS	50.26	2	2
AL	7	0	MICROG/G	203.28	105.98 - 300.58	+-48	.1	NAA	267.59	4	-
							.3	AES	117.53	3	-
AS	13	19	MICROG/G	12.82	11.93 - 13.70	+-7	.1	NAA	12.59	4	-
							.2	AAS	12.99	3	2
							.3	AES	13.08	4	-
							.4	XRF	13.17	1	1
							.6	PIX	11.82	1	-
AU	3	25	NANOG/G	15.38	13.15 - 17.61	+-14	.1	NAA	15.38	3	1
B	2	0	MICROG/G	28.49	-		.3	AES	28.49	2	-
BA	2	0	MICROG/G	1.13	-		.3	AES	1.13	2	-
BR	6	0	MICROG/G	353.12	310.51 - 395.74	+-12	.1	NAA	362.22	4	-
							.4	XRF	314.03	1	-
							.6	PIX	355.83	1	-
CA	7	13	MILIG/G	14.80	13.99 - 15.60	+-5	.1	NAA	15.66	2	-
							.2	AAS	14.65	1	-
							.3	AES	14.07	3	-
							.4	XRF	15.40	1	-
							.6	PIX		-	1
CD	36	5	MICROG/G	1.29	1.12 - 1.45	+-13	.1	NAA	1.49	1	-
							.2	AAS	1.28	28	1
							.3	AES	1.26	4	-
							.4	XRF	1.65	1	-
							.7	ECM	1.13	2	1
CE	2	0	MICROG/G	0.51	-		.1	NAA	0.51	2	-
CL	3	40	MILIG/G	86.10	80.21 - 91.99	+-7	.1	NAA	85.23	2	1
							.4	XRF		-	1
							.6	PIX	87.83	1	-

TABLE NO. 53 (CONTINUED)

COMPARISON OF THE OVERALL MEANS WITH THE MEAN VALUES OBTAINED BY VARIOUS ANALYTICAL METHODS IN INTERCOMPARISON IAEA/RUN MA-M-2/TM

ELEMENT	NUMBER OF ACCEPTED RESULTS	PERCENTAGE OF OUTLIERS (%)	UNIT	OVERALL VALUE	OVERALL CONFIDENCE LIMITS (0.05)	MEAN RELATIVE UNCERTAINTY (%)	ANALYTICAL METHODS USED CODE NO.	ABBREV.	OBTAINED MEAN VALUE	BY THE METHOD NUMBER OF ACCEPTED RESULTS	BY THE METHOD NUMBER OF OUTLIERS
CO	19	24	MICROG/G	0.87	0.73 - 1.01	+-16	.1	NAA	0.78	10	1
							.2	AAS	1.01	6	5
							.3	AES	0.77	2	-
							.7	ECM	1.14	1	-
CR	29	6	MICROG/G	1.48	1.20 - 1.76	+-19	.1	NAA	1.37	10	-
							.2	AAS	1.62	15	2
							.3	AES	1.03	3	-
							.4	XRF	1.83	1	-
CS	2	0	NANOG/G	81.29	-		.1	NAA	81.29	2	-
CU	41	9	MICROG/G	7.72	6.98 - 8.47	+-10	.1	NAA	9.01	1	2
							.2	AAS	7.70	29	2
							.3	AES	7.00	6	-
							.4	XRF	5.92	2	-
							.6	PIX	9.15	1	-
							.7	ECM	10.68	2	-
EU	3	0	NANOG/G	10.69	0.00 - 22.14	+-107	.1	NAA	10.69	3	-
F	1	0	MICROG/G	12.08	-		.9	OM	12.08	1	-
FE	39	3	MICROG/G	244.17	231.20 - 257.14	+-5	.1	NAA	260.22	10	-
							.2	AAS	242.90	21	-
							.3	AES	222.53	6	-
							.4	XRF	281.50	1	1
							.6	PIX	202.83	1	-
HF	1	0	NANOG/G	13.00	-		.1	NAA	13.00	1	-
HG	18	14	MICROG/G	0.96	0.86 - 1.05	+-10	.1	NAA	1.05	3	1
							.2	AAS	0.93	14	1
							.3	AES	-	-	1
							.4	XRF	0.98	1	-
I	2	0	MICROG/G	10.27	-		.1	NAA	10.27	2	-

TABLE NO. 53 (CONTINUED)

COMPARISON OF THE OVERALL MEANS WITH THE MEAN VALUES OBTAINED BY VARIOUS ANALYTICAL METHODS IN INTERCOMPARISON IAEA/RUN MA-M-2/TM

ELEMENT	NUMBER OF ACCEPTED RESULTS	PERCENTAGE OF OUTLIERS (%)	UNIT	OVERALL VALUE	OVERALL CONFIDENCE LIMITS (0.05)	MEAN RELATIVE UNCERTAINTY (%)	ANALYTICAL METHODS USED CODE NO.	ABBREV.	OBTAINED MEAN VALUE	BY THE METHOD NUMBER OF ACCEPTED RESULTS	NUMBER OF OUTLIERS
K	9	0	MILIG/G	11.59	9.78 - 13.39	+-16	.1	NAA	11.46	3	-
							.3	AES	13.58	3	-
							.4	XRF	10.23	2	-
							.6	PIX	8.72	1	-
LA	2	0	MICROG/G	0.54	-		.1	NAA	0.54	2	-
LI	1	0	MICROG/G	0.90	-		.2	AAS	0.90	1	-
MG	6	14	MILIG/G	6.01	5.39 - 6.63	+-10	.1	NAA	5.94	1	1
							.2	AAS	6.68	1	-
							.3	AES	5.86	4	-
MN	34	6	MICROG/G	66.17	61.64 - 70.71	+-7	.1	NAA	67.09	7	-
							.2	AAS	68.37	18	2
							.3	AES	63.31	7	-
							.4	XRF	69.85	1	-
							.6	PIX	36.50	1	-
MO	3	25	MICROG/G	1.21	0.33 - 2.09	+-73	.2	AAS	1.41	2	-
							.3	AES		-	1
							.4	XRF	0.80	1	-
NA	7	0	MILIG/G	45.44	44.19 - 46.69	+-3	.1	NAA	46.03	4	-
							.3	AES	44.65	3	-
NI	16	30	MICROG/G	1.47	1.17 - 1.76	+-20	.1	NAA	1.12	1	1
							.2	AAS	1.66	8	6
							.3	AES	1.17	4	-
							.4	XRF	1.20	1	-
							.6	PIX	1.35	1	-
							.7	ECM	1.86	1	-
P	2	0	MILIG/G	7.65	-		.3	AES	7.65	2	-
PB	27	16	MICROG/G	2.08	1.72 - 2.45	+-17	.2	AAS	1.78	21	4
							.3	AES		-	1
							.4	XRF	2.45	2	-
							.6	PIX	3.02	1	-
							.7	ECM	3.67	3	-

TABLE NO. 53 (CONTINUED)

COMPARISON OF THE OVERALL MEANS WITH THE MEAN VALUES OBTAINED BY VARIOUS ANALYTICAL METHODS IN INTERCOMPARISON IAEA/RUN MA-M-2/IM

ELEMENT	NUMBER OF ACCEPTED RESULTS	PERCENTAGE OF OUTLIERS (%)	UNIT	OVERALL VALUE	OVERALL CONFIDENCE LIMITS (0.05)	MEAN RELATIVE UNCERTAINTY (%)	ANALYTICAL METHODS USED CODE NO.	ABBREV.	OBTAINED BY THE METHOD MEAN VALUE	NUMBER OF ACCEPTED RESULTS	NUMBER OF OUTLIERS
RB	11	0	MICROG/G	6.75	5.87 - 7.63	+-13	.1	NAA	6.37	8	-
							.4	XRF	7.73	2	-
							.6	PIX	7.80	1	-
S	4	0	MILIG/G	20.22	13.61 - 26.83	+-33	.3	AES	20.26	1	-
							.4	XRF	17.48	2	-
							.6	PIX	25.67	1	-
SB	3	50	NANOG/G	27.72	23.88 - 31.57	+-14	.1	NAA	27.72	3	2
							.2	AAS		-	1
SC	4	20	NANOG/G	45.11	41.25 - 48.97	+-9	.1	NAA	45.11	4	1
SE	16	11	MICROG/G	2.19	1.99 - 2.40	+-9	.1	NAA	2.21	9	1
							.2	AAS	1.82	3	1
							.3	AES	2.63	1	-
							.4	XRF	2.14	1	-
							.5	FL	2.24	1	-
							.6	PIX	2.70	1	-
SR	8	20	MICROG/G	100.31	95.70 - 104.93	+-5	.1	NAA	105.33	2	-
							.2	AAS		-	1
							.3	AES	95.87	3	1
							.4	XRF	99.02	2	-
							.6	PIX	106.17	1	-
TA	1	0	NANOG/G	4.92	-		.1	NAA	4.92	1	-
TB	1	0	NANOG/G	6.52	-		.1	NAA	6.52	1	-
TE	1	0	MICROG/G	1.55	-		.1	NAA	1.55	1	-
TH	2	0	NANOG/G	64.17	-		.1	NAA	64.17	2	-
TI	2	0	MICROG/G	1.65	-		.3	AES	1.65	2	-

TABLE NO. 53 (CONTINUED)

COMPARISON OF THE OVERALL MEANS WITH THE MEAN VALUES OBTAINED BY VARIOUS ANALYTICAL METHODS IN INTERCOMPARISON IAEA/RUN MA-M-2/TM

ELEMENT	NUMBER OF ACCEPTED RESULTS	PERCENTAGE OF OUTLIERS (%)	UNIT	OVERALL MEAN VALUE	OVERALL CONFIDENCE LIMITS (0.05)	OVERALL MEAN RELATIVE UNCERTAINTY (%)	ANALYTICAL METHODS USED CODE NO.	ABBREV.	OBTAINED BY THE METHOD MEAN VALUE	NUMBER OF ACCEPTED RESULTS	NUMBER OF OUTLIERS
U	1	0	MICROG/G	0.19	-		.1	NAA	0.19	1	-
V	6	25	MICROG/G	1.49	0.97 - 2.01	+-35	.1	NAA	1.21	2	1
							.2	AAS	1.68	1	1
							.3	AES	1.34	2	-
							.4	XRF	2.18	1	-
ZN	40	17	MICROG/G	159.86	154.25 - 165.47	+-4	.1	NAA	159.76	10	1
							.2	AAS	164.67	22	5
							.3	AES	145.78	6	-
							.4	XRF	169.05	1	1
							.6	PIX	130.17	1	-
							.7	ECM		-	1

TABLE NO. 54

COMPARISON OF THE OVERALL MEDIANS WITH THE MEDIAN VALUES OBTAINED BY VARIOUS ANALYTICAL METHODS IN INTERCOMPARISON IAEA/RUN MA-M-2/TM

ELEMENT	NUMBER OF ACCEPTED RESULTS	PERCENTAGE OF OUTLIERS (%)	UNIT	OVERALL MEDIAN VALUE	OVERALL MEDIAN CONFIDENCE LIMITS (0.05)	OVERALL MEDIAN RELATIVE UNCERTAINTY (%)	ANALYTICAL METHODS USED CODE NO.	ABBREV.	MEDIAN VALUE	OBTAINED BY THE METHOD NUMBER OF ACCEPTED RESULTS	NUMBER OF OUTLIERS
AG	5	38	NANOG/G	54.17	45.17 - 61.92	-17; +14	.1	NAA	57.50	3	1
							.2	AAS	50.26	2	2
AL	7	0	MICROG/G	194.00	58.58 - 359.17	-70; +85	.1	NAA	258.60	4	-
							.3	AES	120.00	3	-
AS	13	19	MICROG/G	12.85	11.82 - 14.36	-8; +12	.1	NAA	12.53	4	-
							.2	AAS	12.97	3	2
							.3	AES	13.35	4	-
							.4	XRF	13.17	1	1
							.6	PIX	11.82	1	-
AU	3	25	NANOG/G	15.50	14.43 - 16.22	-7; +5	.1	NAA	15.50	3	1
B	2	0	MICROG/G	28.49	-		.3	AES	28.49	2	-
BA	2	0	MICROG/G	1.13	-		.3	AES	1.13	2	-
BR	6	0	MICROG/G	357.79	304.17 - 416.67	-15; +16	.1	NAA	364.02	4	-
							.4	XRF	314.03	1	-
							.6	PIX	355.83	1	-
CA	7	13	MILIG/G	14.80	13.68 - 16.07	-8; +9	.1	NAA	15.66	2	-
							.2	AAS	14.65	1	-
							.3	AES	13.73	3	-
							.4	XRF	15.40	1	-
							.6	PIX		-	1
CD	36	5	MICROG/G	1.32	1.17 - 1.53	-12; +16	.1	NAA	1.49	1	-
							.2	AAS	1.32	28	1
							.3	AES	1.19	4	-
							.4	XRF	1.65	1	-
							.7	ECM	1.13	2	1
CE	2	0	MICROG/G	0.51	-		.1	NAA	0.51	2	-
CL	3	40	MILIG/G	87.07	83.40 - 87.83	-4; +1	.1	NAA	85.23	2	1
							.4	XRF		-	1
							.6	PIX	87.83	1	-

TABLE NO. 54 (CONTINUED)

COMPARISON OF THE OVERALL MEDIANS WITH THE MEDIAN VALUES OBTAINED BY VARIOUS ANALYTICAL METHODS IN INTERCOMPARISON IAEA/RUN MA-M-2/TM

ELEMENT	NUMBER OF ACCEPTED RESULTS	PERCENTAGE OF OUTLIERS (%)	UNIT	OVERALL MEDIAN VALUE	OVERALL MEDIAN CONFIDENCE LIMITS (0.05)	OVERALL MEDIAN RELATIVE UNCERTAINTY (%)	ANALYTICAL METHODS USED CODE NO.	ABBREV.	OBTAINED BY THE METHOD MEDIAN VALUE	OBTAINED BY THE METHOD NUMBER OF ACCEPTED RESULTS	OBTAINED BY THE METHOD NUMBER OF OUTLIERS
CO	19	24	MICROG/G	0.88	0.76 - 1.07	-14; +21	.1	NAA	0.86	10	1
							.2	AAS	1.03	6	5
							.3	AES	0.77	2	-
							.7	ECM	1.14	1	-
CR	29	6	MICROG/G	1.25	0.95 - 1.61	-24; +29	.1	NAA	1.31	10	-
							.2	AAS	1.27	15	2
							.3	AES	0.95	3	-
							.4	XRF	1.83	1	-
CS	2	0	NANOG/G	81.29	-		.1	NAA	81.29	2	-
CU	41	9	MICROG/G	7.96	7.54 - 8.44	-5; +6	.1	NAA	9.01	1	2
							.2	AAS	7.96	29	2
							.3	AES	7.03	6	-
							.4	XRF	5.92	2	-
							.6	PIX	9.15	1	-
							.7	ECM	10.68	2	-
EU	3	0	NANOG/G	8.32	7.75 - 16.00	-7; +92	.1	NAA	8.32	3	-
F	1	0	MICROG/G	12.08	-		.9	OM	12.08	1	-
FE	39	3	MICROG/G	256.17	229.20 - 268.17	-11; +5	.1	NAA	268.96	10	-
							.2	AAS	253.40	21	-
							.3	AES	224.58	6	-
							.4	XRF	281.50	1	1
							.6	PIX	202.83	1	-
HF	1	0	NANOG/G	13.00	-		.1	NAA	13.00	1	-
HG	18	14	MICROG/G	0.95	0.86 - 1.06	-10; +11	.1	NAA	0.94	3	1
							.2	AAS	0.95	14	1
							.3	AES	-	-	1
							.4	XRF	0.98	1	-
I	2	0	MICROG/G	10.27	-		.1	NAA	10.27	2	-

TABLE NO. 54 (CONTINUED)

COMPARISON OF THE OVERALL MEDIANS WITH THE MEDIAN VALUES OBTAINED BY VARIOUS ANALYTICAL METHODS IN INTERCOMPARISON IAEA/RUN MA-M-2/TM

ELEMENT	NUMBER OF ACCEPTED RESULTS	PERCENTAGE OF OUTLIERS (%)	UNIT	OVERALL MEDIAN VALUE	OVERALL MEDIAN CONFIDENCE LIMITS (0.05)	OVERALL MEDIAN RELATIVE UNCERTAINTY (%)	ANALYTICAL METHODS USED CODE NO.	ABBREV.	OBTAINED BY THE METHOD MEDIAN VALUE	NUMBER OF ACCEPTED RESULTS	NUMBER OF OUTLIERS
K	9	0	MILIG/G	11.73	8.72 - 13.09	-26; +12	.1	NAA	11.73	3	-
							.3	AES	13.09	3	-
							.4	XRF	10.23	2	-
							.6	PIX	8.72	1	-
LA	2	0	MICROG/G	0.54	-		.1	NAA	0.54	2	-
LI	1	0	MICROG/G	0.90	-		.2	AAS	0.90	1	-
MG	6	14	MILIG/G	5.94	5.23 - 6.70	-12; +13	.1	NAA	5.94	1	1
							.2	AAS	6.68	1	-
							.3	AES	5.75	4	-
MN	34	6	MICROG/G	67.09	60.75 - 75.25	-9; +12	.1	NAA	65.83	7	-
							.2	AAS	71.51	18	2
							.3	AES	65.00	7	-
							.4	XRF	69.85	1	-
							.6	PIX	36.50	1	-
MO	3	25	MICROG/G	1.37	0.80 - 1.46	-41; +7	.2	AAS	1.41	2	-
							.3	AES		-	1
							.4	XRF	0.80	1	-
NA	7	0	MILIG/G	45.51	44.03 - 47.68	-3; +5	.1	NAA	46.07	4	-
							.3	AES	44.33	3	-
NI	16	30	MICROG/G	1.40	0.89 - 2.04	-36; +45	.1	NAA	1.12	1	1
							.2	AAS	1.81	8	6
							.3	AES	1.14	4	-
							.4	XRF	1.20	1	-
							.6	PIX	1.35	1	-
							.7	ECM	1.86	1	-
P	2	0	MILIG/G	7.65	-		.3	AES	7.65	2	-
PB	27	16	MICROG/G	1.92	1.54 - 2.50	-20; +30	.2	AAS	1.78	21	4
							.3	AES		-	1
							.4	XRF	2.45	2	-
							.6	PIX	3.02	1	-
							.7	ECM	3.92	3	-

TABLE NO. 54 (CONTINUED)

COMPARISON OF THE OVERALL MEDIANS WITH THE MEDIAN VALUES OBTAINED BY VARIOUS ANALYTICAL METHODS IN INTERCOMPARISON IAEA/RUN MA-M-2/TM

ELEMENT	NUMBER OF ACCEPTED RESULTS	PERCENTAGE OF OUTLIERS (%)	UNIT	OVERALL MEDIAN VALUE	OVERALL MEDIAN CONFIDENCE LIMITS (0.05)	OVERALL MEDIAN RELATIVE UNCERTAINTY (%)	ANALYTICAL METHODS USED CODE NO.	ABBREV.	OBTAINED MEDIAN VALUE	BY THE METHOD NUMBER OF ACCEPTED RESULTS	BY THE METHOD NUMBER OF OUTLIERS
RB	11	0	MICROG/G	6.96	5.31 - 7.80	-24; +12	.1	NAA	6.72	8	-
							.4	XRF	7.73	2	-
							.6	PIX	7.80	1	-
S	4	0	MILIG/G	19.81	15.60 - 25.67	-21; +30	.3	AES	20.26	1	-
							.4	XRF	17.48	2	-
							.6	PIX	25.67	1	-
SB	3	50	NANOG/G	27.00	26.67 - 29.50	-1; +9	.1	NAA	27.00	3	2
							.2	AAS		-	1
SC	4	20	NANOG/G	45.09	42.25 - 48.00	-6; +6	.1	NAA	45.09	4	1
SE	16	11	MICROG/G	2.27	1.70 - 2.56	-25; +13	.1	NAA	2.31	9	1
							.2	AAS	1.70	3	1
							.3	AES	2.63	1	-
							.4	XRF	2.14	1	-
							.5	FL	2.24	1	-
							.6	PIX	2.70	1	-
SR	8	20	MICROG/G	101.33	91.50 - 106.67	-10; +5	.1	NAA	105.33	2	-
							.2	AAS		-	1
							.3	AES	94.45	3	1
							.4	XRF	99.02	2	-
							.6	PIX	106.17	1	-
TA	1	0	NANOG/G	4.92	-		.1	NAA	4.92	1	-
TB	1	0	NANOG/G	6.52	-		.1	NAA	6.52	1	-
TE	1	0	MICROG/G	1.55	-		.1	NAA	1.55	1	-
TH	2	0	NANOG/G	64.17	-		.1	NAA	64.17	2	-
TI	2	0	MICROG/G	1.65	-		.3	AES	1.65	2	-

TABLE NO. 54 (CONTINUED)

COMPARISON OF THE OVERALL MEDIANS WITH THE MEDIAN VALUES OBTAINED BY VARIOUS ANALYTICAL METHODS IN INTERCOMPARISON IAEA/RUN MA-M-2/TM

ELEMENT	NUMBER OF ACCEPTED RESULTS	PERCENTAGE OF OUTLIERS (%)	UNIT	OVERALL MEDIAN VALUE	OVERALL MEDIAN CONFIDENCE LIMITS (0.05)	OVERALL MEDIAN RELATIVE UNCERTAINTY (%)	ANALYTICAL METHODS USED CODE NO.	ABBREV.	OBTAINED BY THE METHOD MEDIAN VALUE	OBTAINED BY THE METHOD NUMBER OF ACCEPTED RESULTS	OBTAINED BY THE METHOD NUMBER OF OUTLIERS
U	1	0	MICROG/G	0.19	-		.1	NAA	0.19	1	-
V	6	25	MICROG/G	1.47	0.84 - 2.18	-43; +48	.1	NAA	1.21	2	1
							.2	AAS	1.68	1	1
							.3	AES	1.34	2	-
							.4	XRF	2.18	1	-
ZN	40	17	MICROG/G	156.50	152.83 - 166.61	-2; +6	.1	NAA	156.05	10	1
							.2	AAS	166.20	22	5
							.3	AES	147.25	6	-
							.4	XRF	169.05	1	1
							.6	PIX	130.17	1	-
							.7	ECM		-	1

Table 55

Concentration values of elements in MA-M-2/TM reference material which can be certified with satisfactory (Class A) or acceptable (Class B) degree of confidence

Element	Unit	Concentration	Confidence interval (significance level 0.05)	Class of results
Arsenic	$\mu g.g^{-1}$	12.8	11.8 - 14.4	A
Bromine	$\mu g.g^{-1}$	357.8	304.1 - 416.7	A
Calcium	$mg.g^{-1}$	14.8	13.6 - 16.1	B
Cadmium	$\mu g.g^{-1}$	1.32	1.16 - 1.54	A
Cobalt	$\mu g.g^{-1}$	0.88	0.75 - 1.07	B
Chromium	$\mu g.g^{-1}$	1.25	0.95 - 1.62	B
Copper	$\mu g.g^{-1}$	7.96	7.53 - 8.44	A
Iron	$\mu g.g^{-1}$	256.2	229.2 - 268.2	B
Mercury	$\mu g.g^{-1}$	0.95	0.85 - 1.06	A
Magnesium	$mg.g^{-1}$	5.94	5.22 - 6.70	B
Manganese	$\mu g.g^{-1}$	67.1	60.7 - 75.3	B
Sodium	$mg.g^{-1}$	45.5	44.0 - 47.7	B
Rubidium	$\mu g.g^{-1}$	6.96	5.30 - 7.80	B
Selenium	$\mu g.g^{-1}$	2.27	1.70 - 2.56	B
Strontium	$\mu g.g^{-1}$	101.3	91.5 - 106.7	B
Zinc	$\mu g.g^{-1}$	156.5	152.8 - 166.7	B

Table 56

Information values (non-certified) for concentrations of certain elements in MA-M-2/TM reference material

Element	Unit	Concentration	Confidence interval (significance level 0.05)
Silver	$ng.g^{-1}$	54.2	45.1 - 62.0
Gold	$ng.g^{-1}$	15.5	14.4 - 16.3
Chlorine	$mg.g^{-1}$	87.1	83.4 - 87.9
Lead	$\mu g.g^{-1}$	1.92	1.53 - 2.50
Antimony	$ng.g^{-1}$	27.0	26.6 - 29.5
Scandium	$ng.g^{-1}$	45.1	42.2 - 48.0

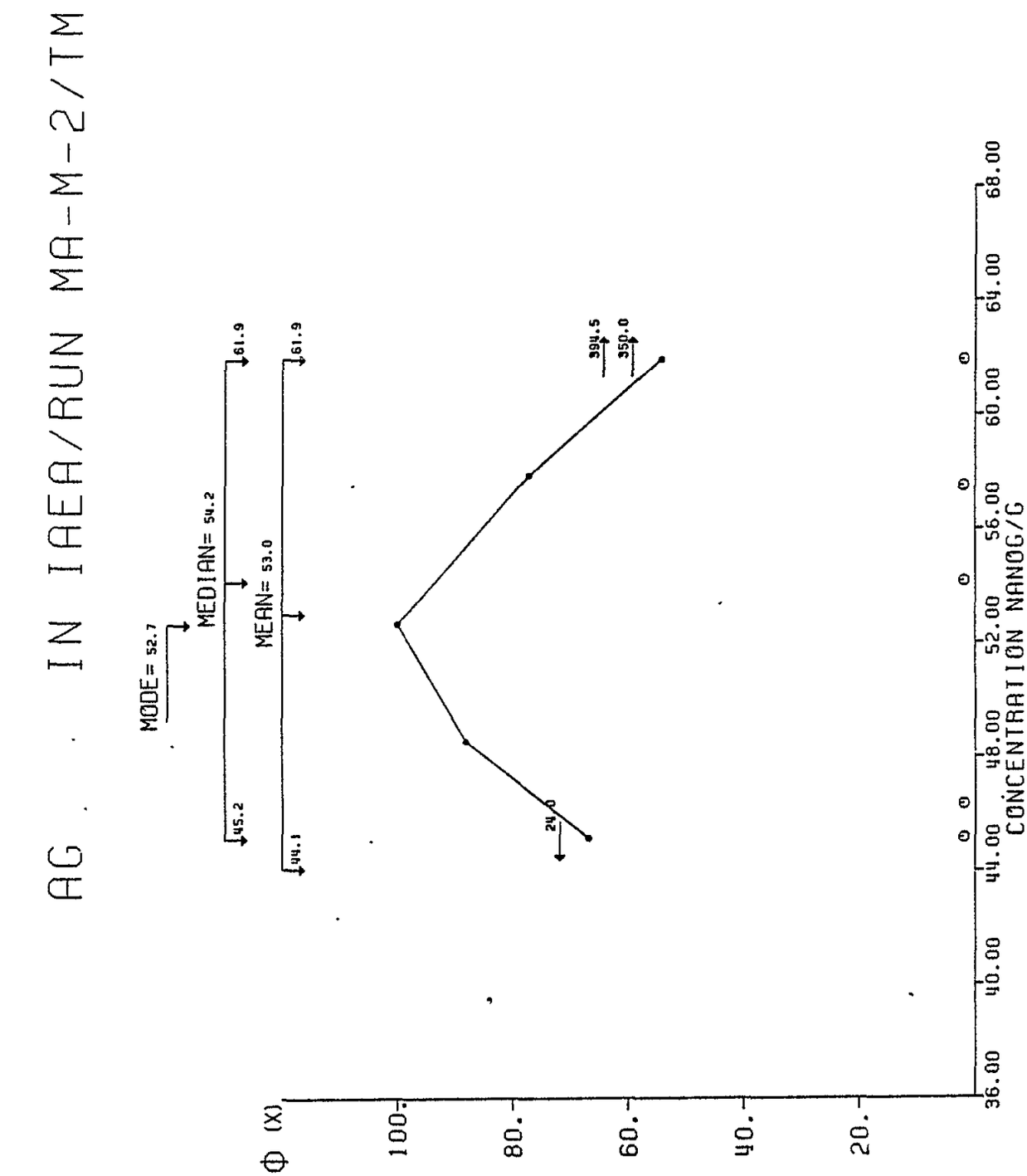
AG IN IAEA/RUN MA-M-2/TM
MODE= 52.7
MEDIAN= 54.2
MEAN= 53.0
61.9
61.9
45.2
44.1
24.0
394.5
350.0
Φ (X)
100.
80.
60.
40.
20.
36.00
40.00
44.00
48.00
52.00
56.00
60.00
64.00
68.00
CONCENTRATION NANOG/G

FIG. 1

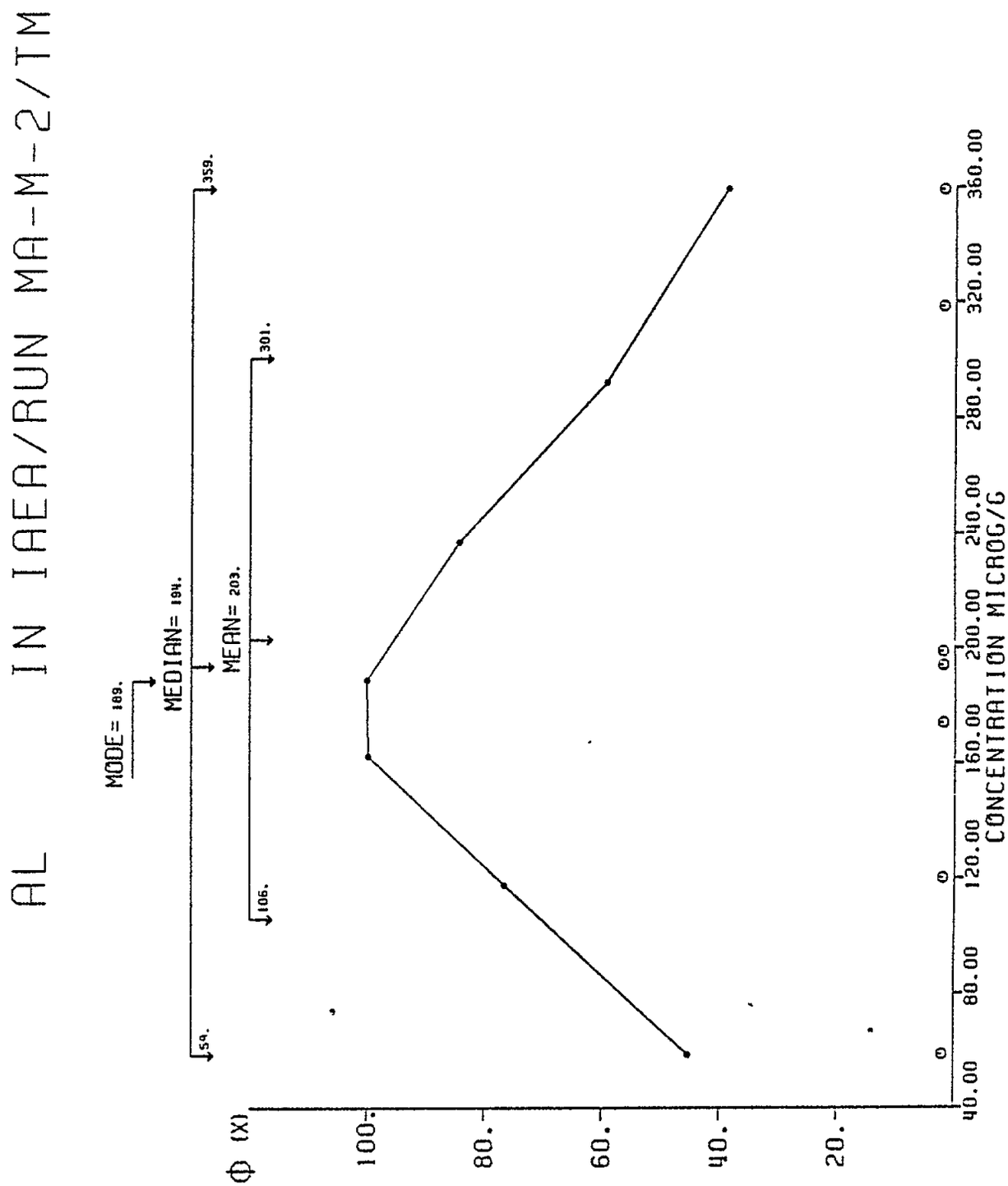
AL IN IAEA/RUN MA-M-2/TM
MODE= 189.
MEDIAN= 194.
MEAN= 203.
359.
301.
106.
59.
Φ (X)
100.
80.
60.
40.
20.
40.00
80.00
120.00
160.00
200.00
240.00
280.00
320.00
360.00
CONCENTRATION MICROG/G

FIG. 2

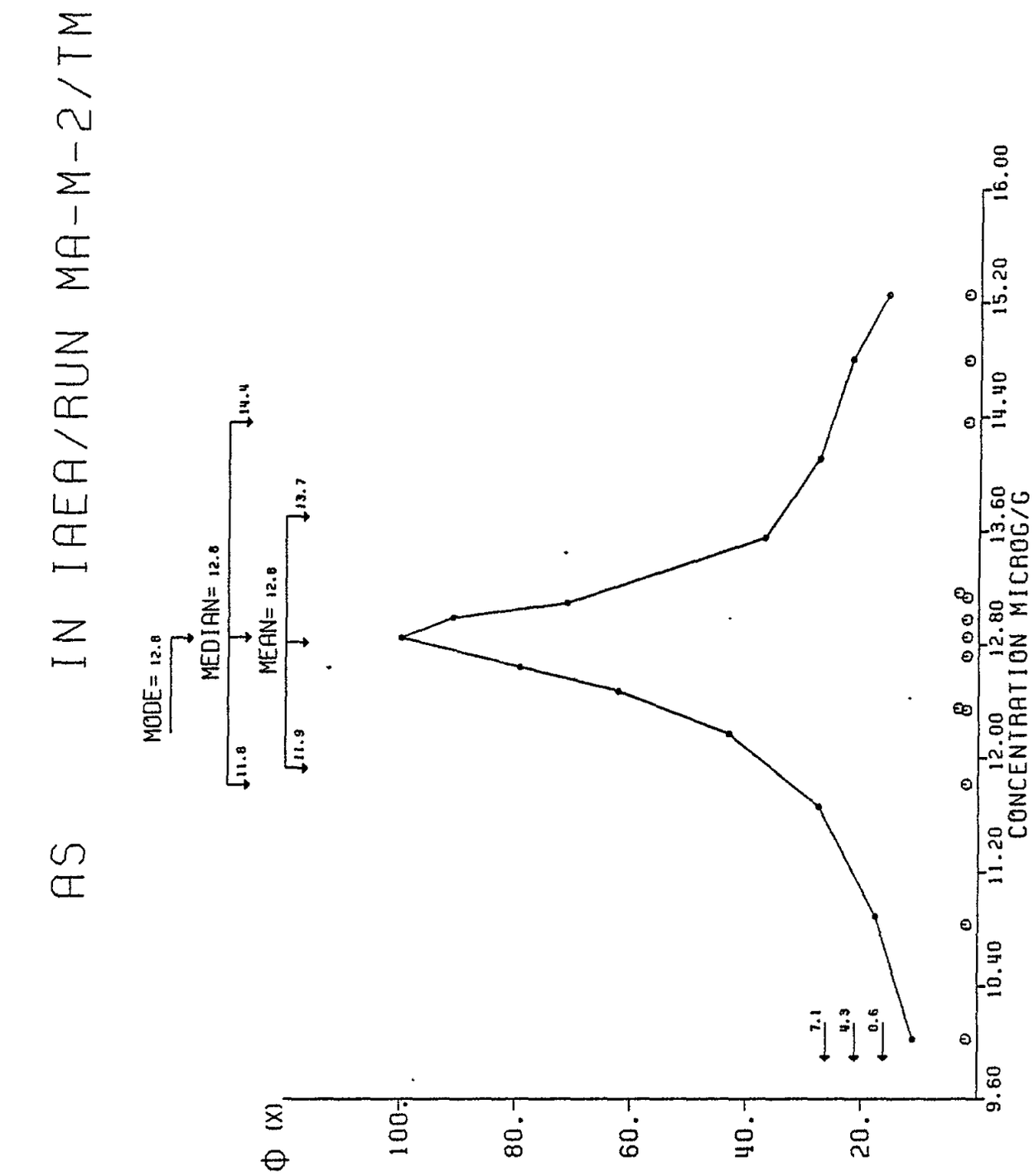
AS IN IAEA/RUN MA-M-2/TM
MODE= 12.8
MEDIAN= 12.8
MEAN= 12.8
11.8
14.4
11.9
13.7
Φ (X)
100.
80.
60.
40.
20.
7.1
4.3
0.6
9.60
10.40
11.20
12.00
12.80
13.60
14.40
15.20
16.00
CONCENTRATION MICROG/G

FIG. 3

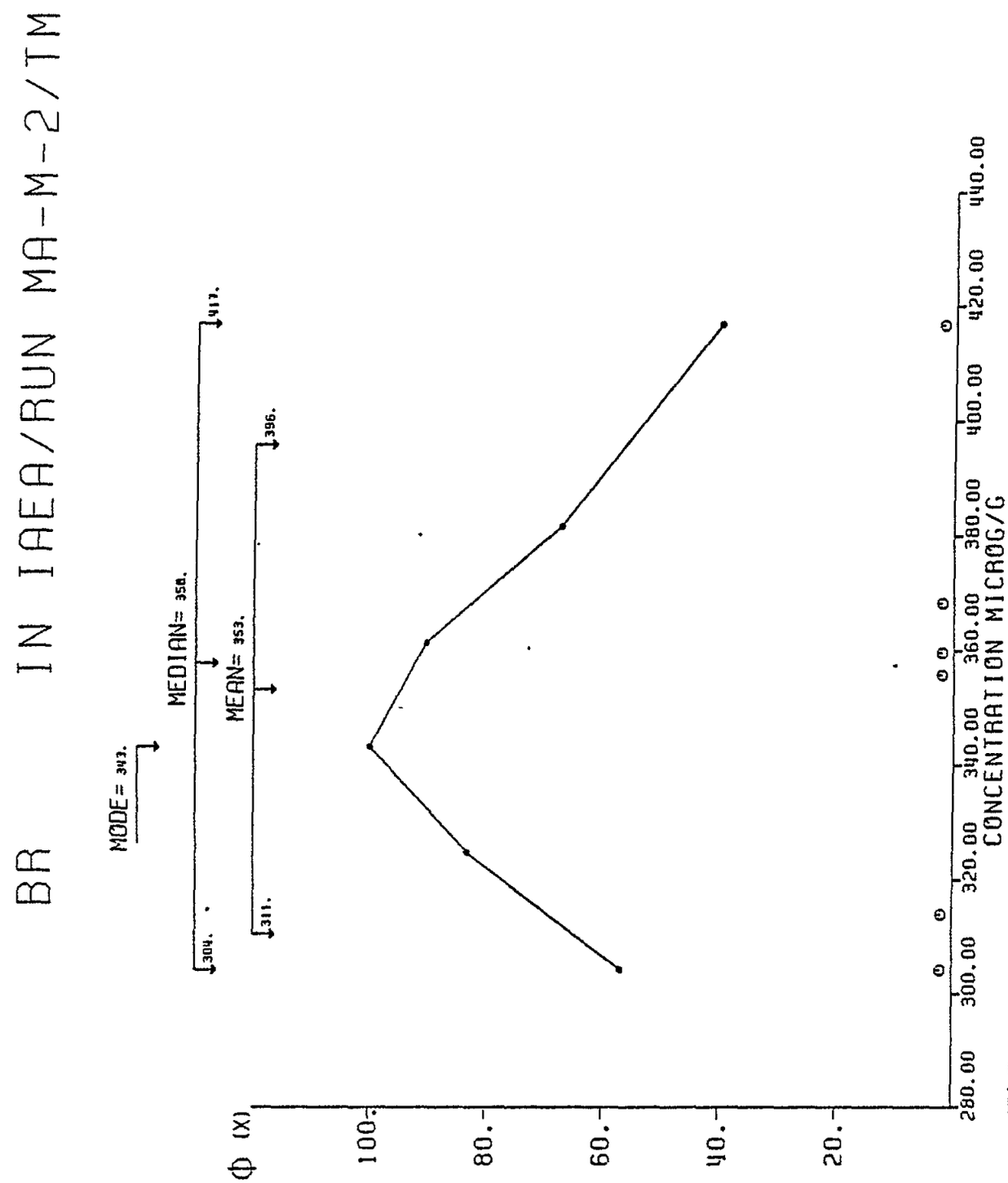
BR IN IAEA/RUN MA-M-2/TM
MODE= 343.
MEDIAN= 358.
MEAN= 353.
304.
311.
396.
411.
Φ (X)
100.
80.
60.
40.
20.
280.00
300.00
320.00
340.00
360.00
380.00
400.00
420.00
440.00
CONCENTRATION MICROG/G

FIG. 4

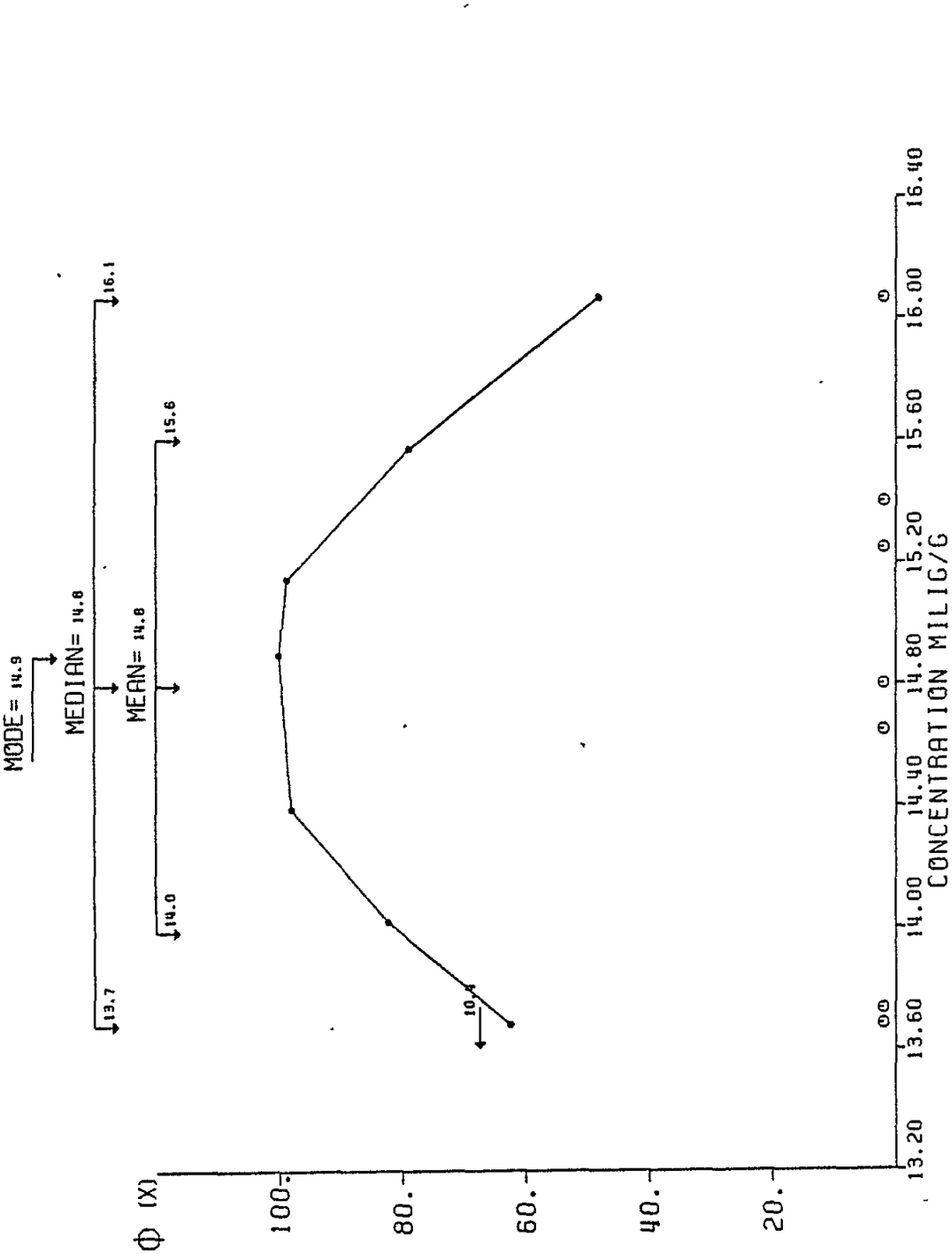
CA IN IAEA/RUN MA-M-2/TM
MODE= 14.9
MEDIAN= 14.8
MEAN= 14.8
16.1
15.6
14.0
13.7
10.4
Φ (X)
100.
80.
60.
40.
20.
13.20
13.60
14.00
14.40
14.80
15.20
15.60
16.00
16.40
CONCENTRATION MILIG/G

FIG. 5

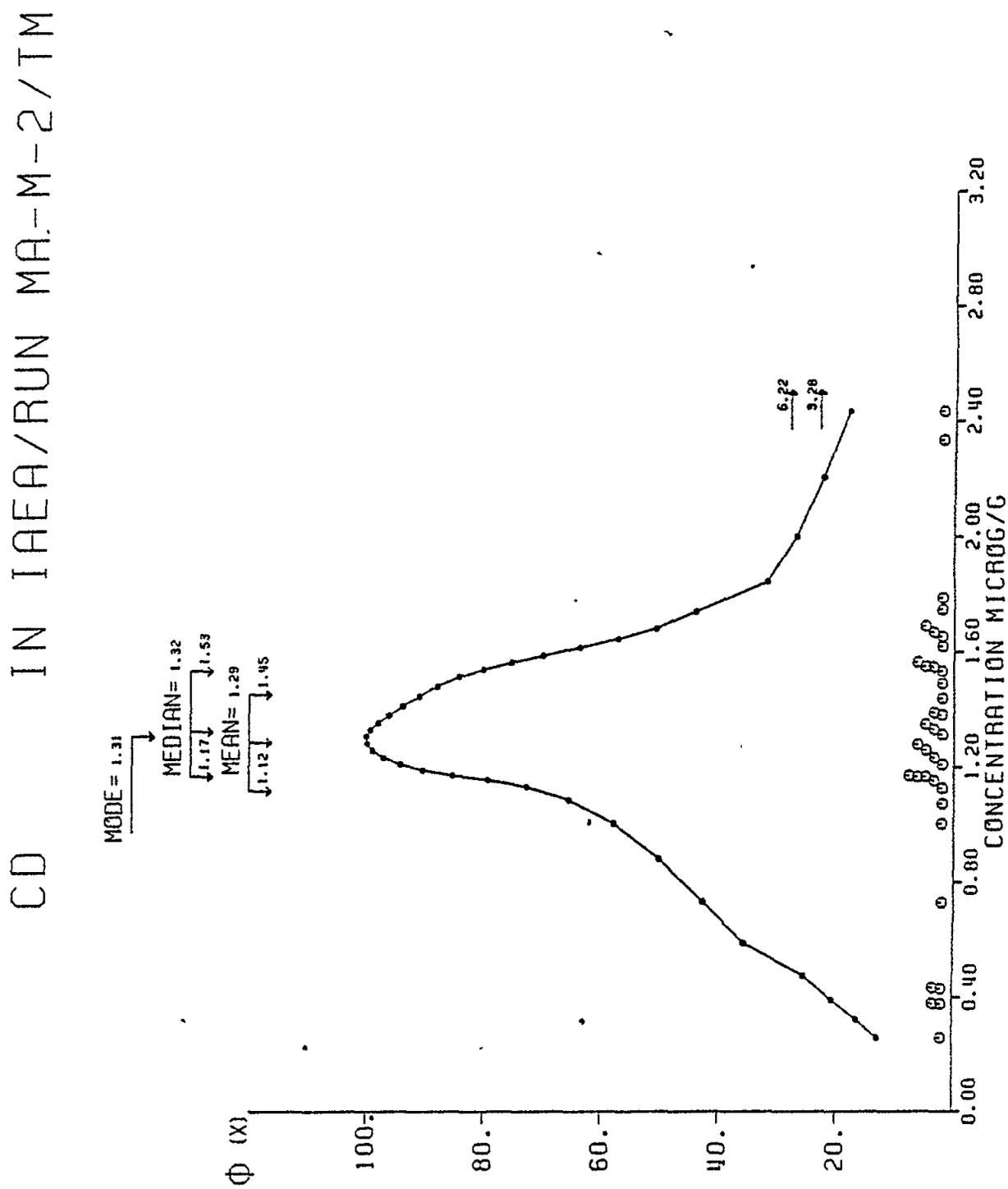
CD IN IAEA/RUN MA.-M-2/TM
MODE= 1.31
MEDIAN= 1.32
1.17
1.53
MEAN= 1.29
1.12
1.45
6.22
3.28
Φ (X)
100.
80.
60.
40.
20.
0.00
0.40
0.80
1.20
1.60
2.00
2.40
2.80
3.20
CONCENTRATION MICROG/G

FIG. 6

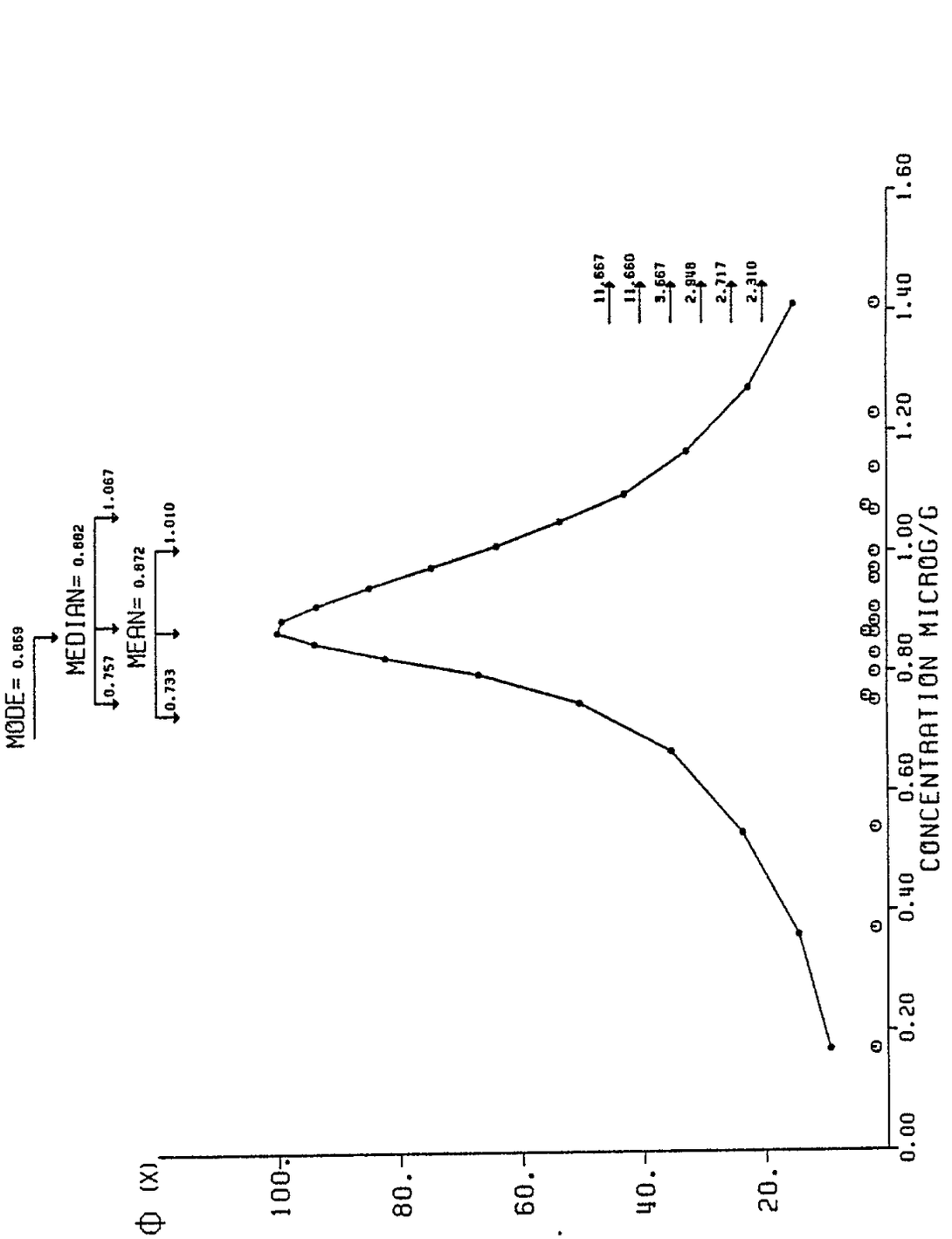
CO IN IAEA/RUN MA-M-2/TM
MODE= 0.869
MEDIAN= 0.882
0.757
1.067
MEAN= 0.872
0.733
1.010
Φ (X)
100.
80.
60.
40.
20.
0.00
0.20
0.40
0.60
0.80
1.00
1.20
1.40
1.60
CONCENTRATION MICROG/G
11.667
11.660
3.667
2.948
2.717
2.310

FIG. 7

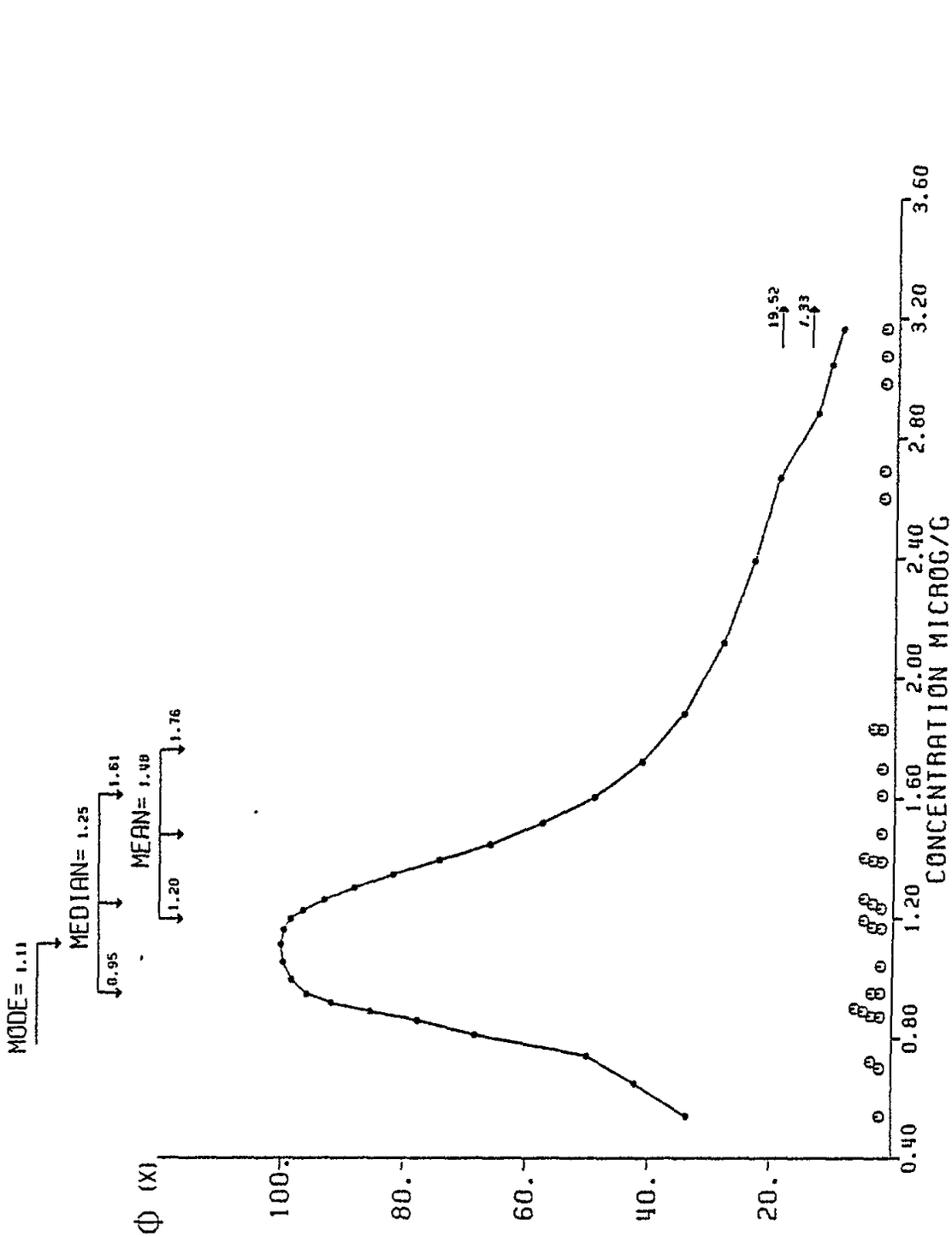
CR IN IAEA/RUN MA-M-2/TM
MODE= 1.11
MEDIAN= 1.25
0.95
1.61
MEAN= 1.48
1.20
1.76
Φ (X)
100.
80.
60.
40.
20.
0.40
0.80
1.20
1.60
2.00
2.40
2.80
3.20
3.60
CONCENTRATION MICROG/G
19.52
1.33

FIG.8

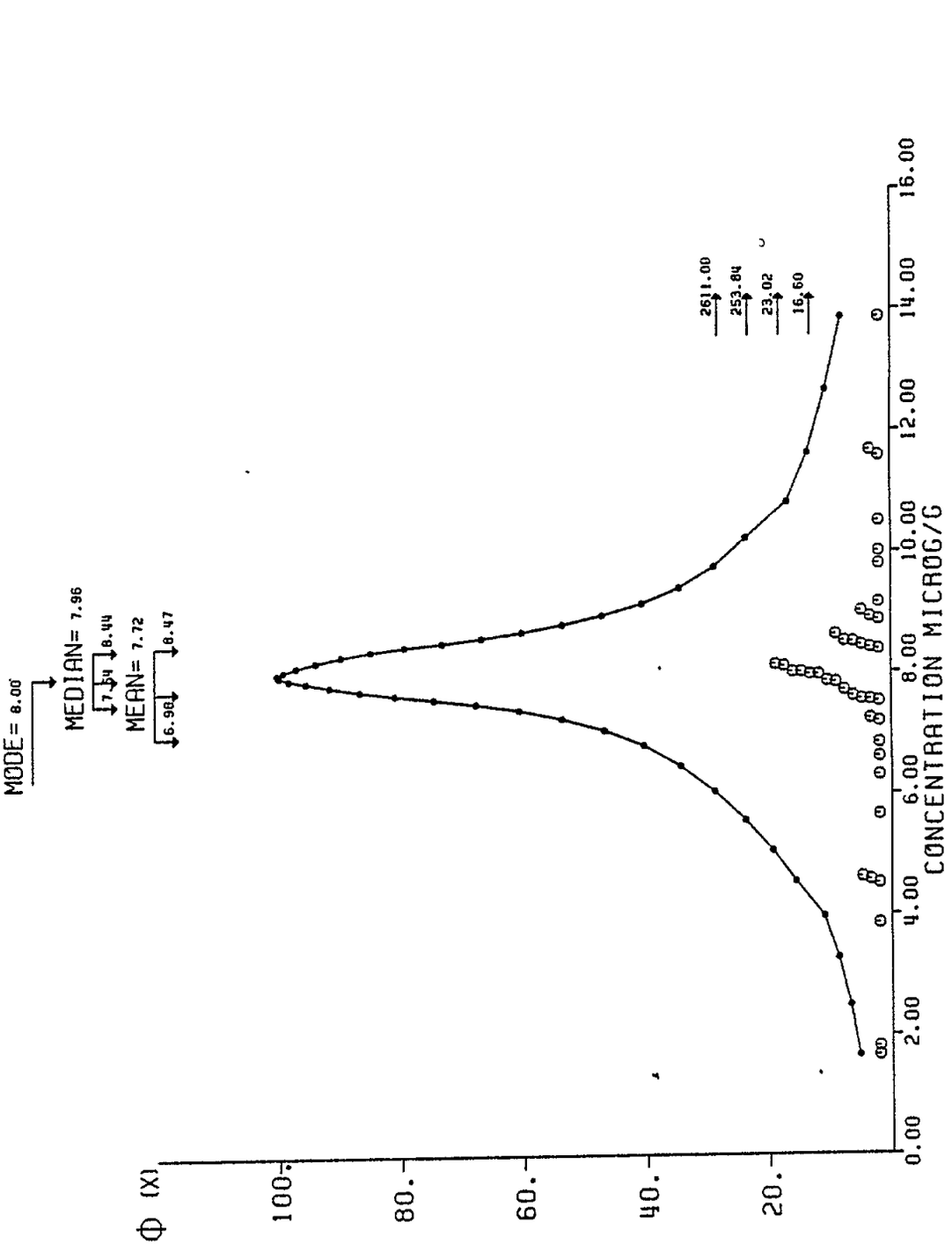
CU IN IAEA/RUN MA-M-2/TM
MODE= 8.00
MEDIAN= 7.96
7.54
8.44
MEAN= 7.72
6.98
8.47
Φ (X)
100.
80.
60.
40.
20.
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
CONCENTRATION MICROG/G
2611.00
253.84
23.02
16.60

FIG. 9

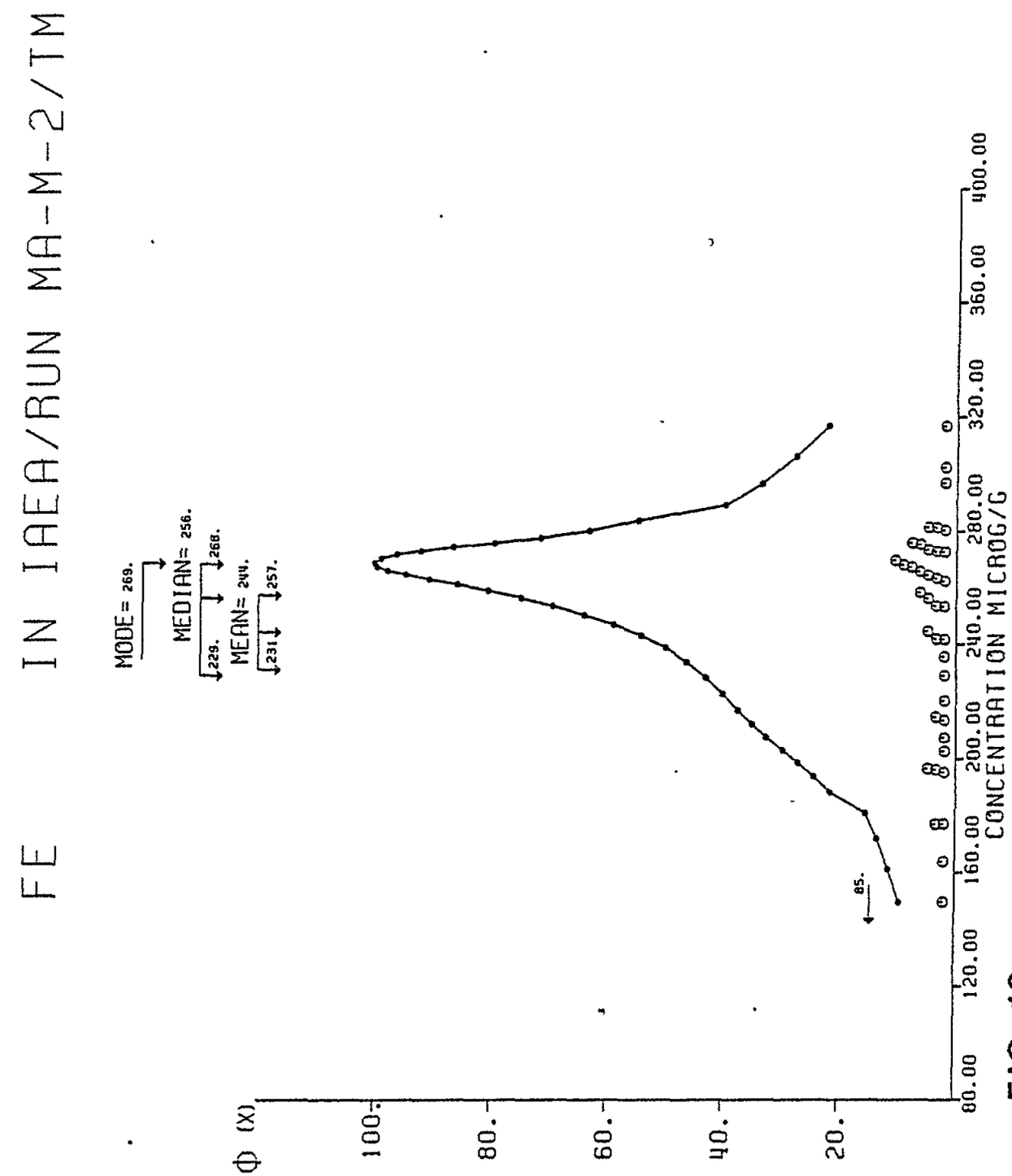
FE IN IAEA/RUN MA-M-2/TM
MODE= 269.
MEDIAN= 256.
229.
268.
MEAN= 244.
231
257.
Φ (X)
100.
80.
60.
40.
20.
85.
80.00
120.00
160.00
200.00
240.00
280.00
320.00
360.00
400.00
CONCENTRATION MICROG/G

FIG. 10

HG IN IAEA/RUN MA-M-2/TM

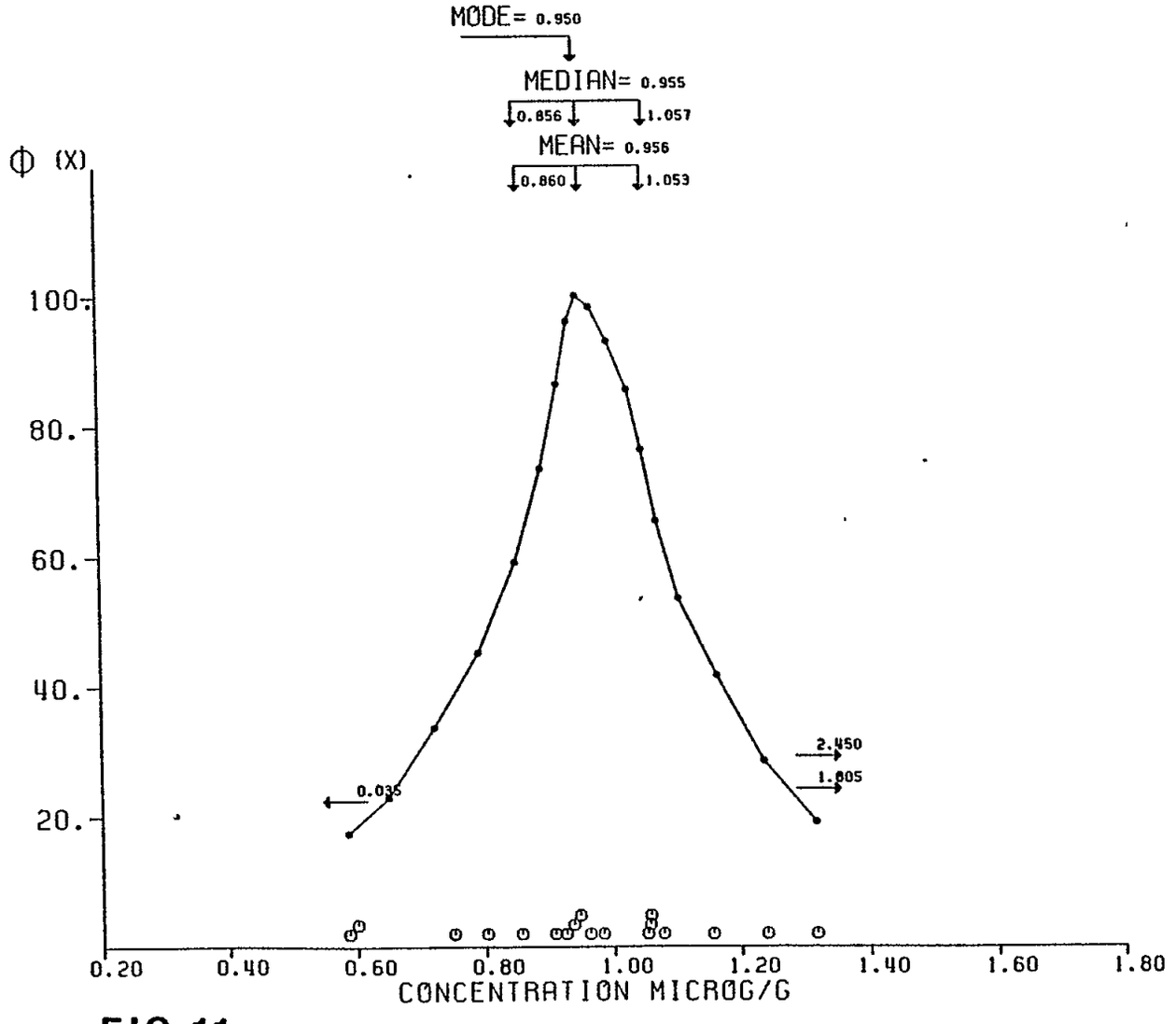

FIG.11

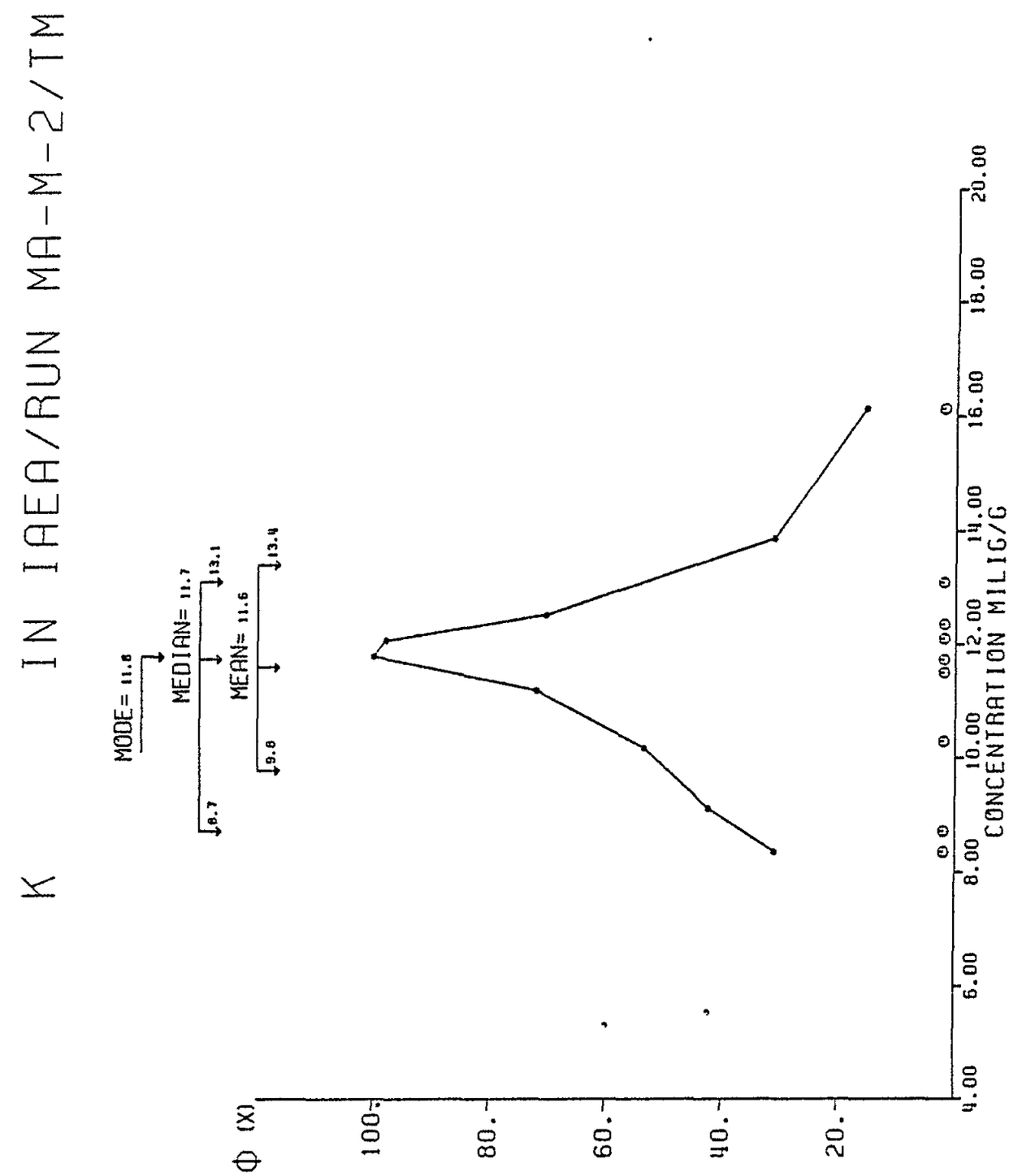
K IN IAEA/RUN MA-M-2/TM
MODE= 11.6
MEDIAN= 11.7
MEAN= 11.6
8.7
13.1
9.8
13.4
Φ (X)
100.
80.
60.
40.
20.
4.00
6.00
8.00
10.00
12.00
14.00
16.00
18.00
20.00
CONCENTRATION MILIG/G

FIG. 12

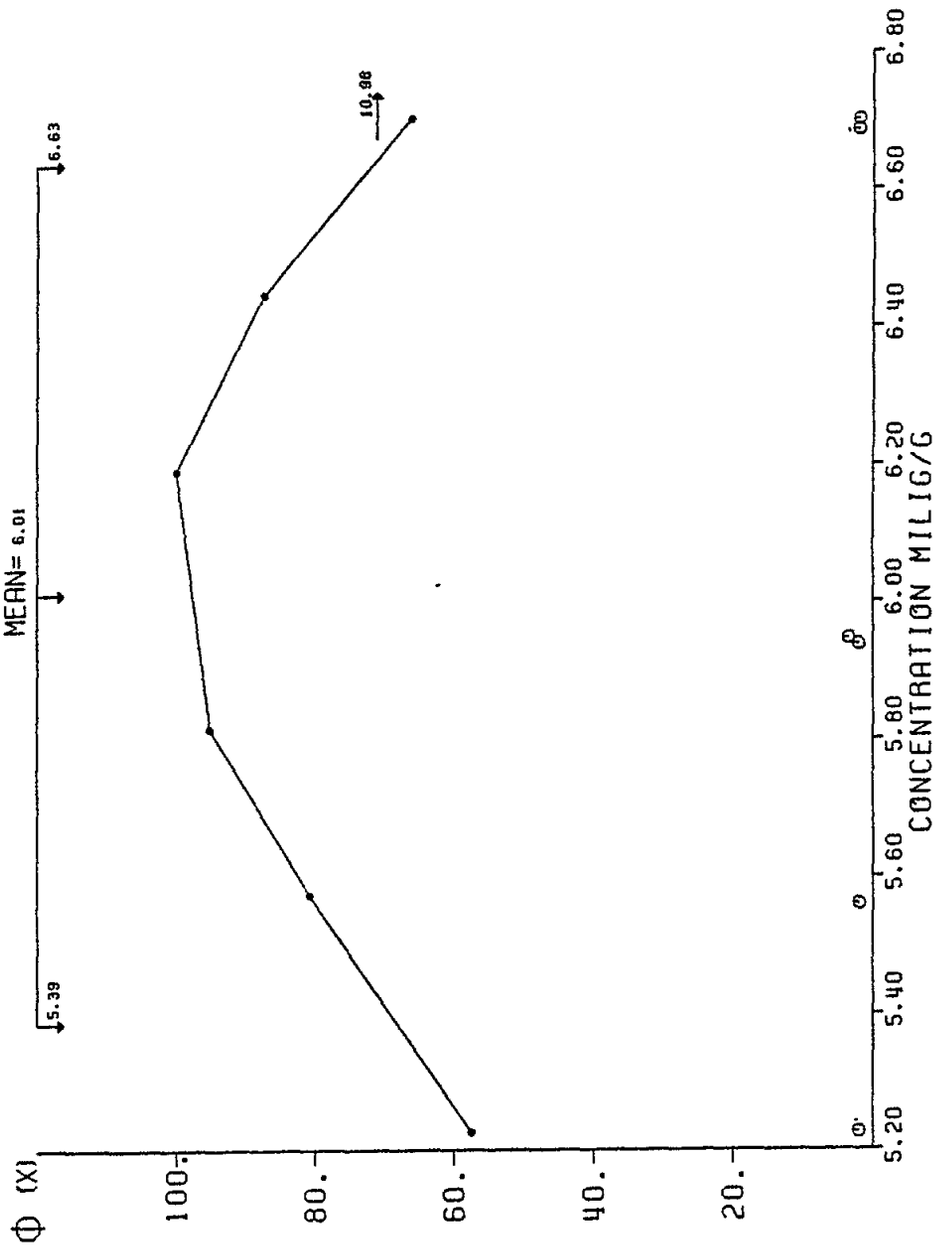
MG IN IAEA/RUN MA-M-2/TM
MODE= 6.19
MEDIAN= 5.94
MEAN= 6.01
6.70
6.63
5.39
5.23
10.98
Φ (X)
100.
80.
60.
40.
20.
0.
5.20
5.40
5.60
5.80
6.00
6.20
6.40
6.60
6.80
CONCENTRATION MILIG/G

FIG. 13

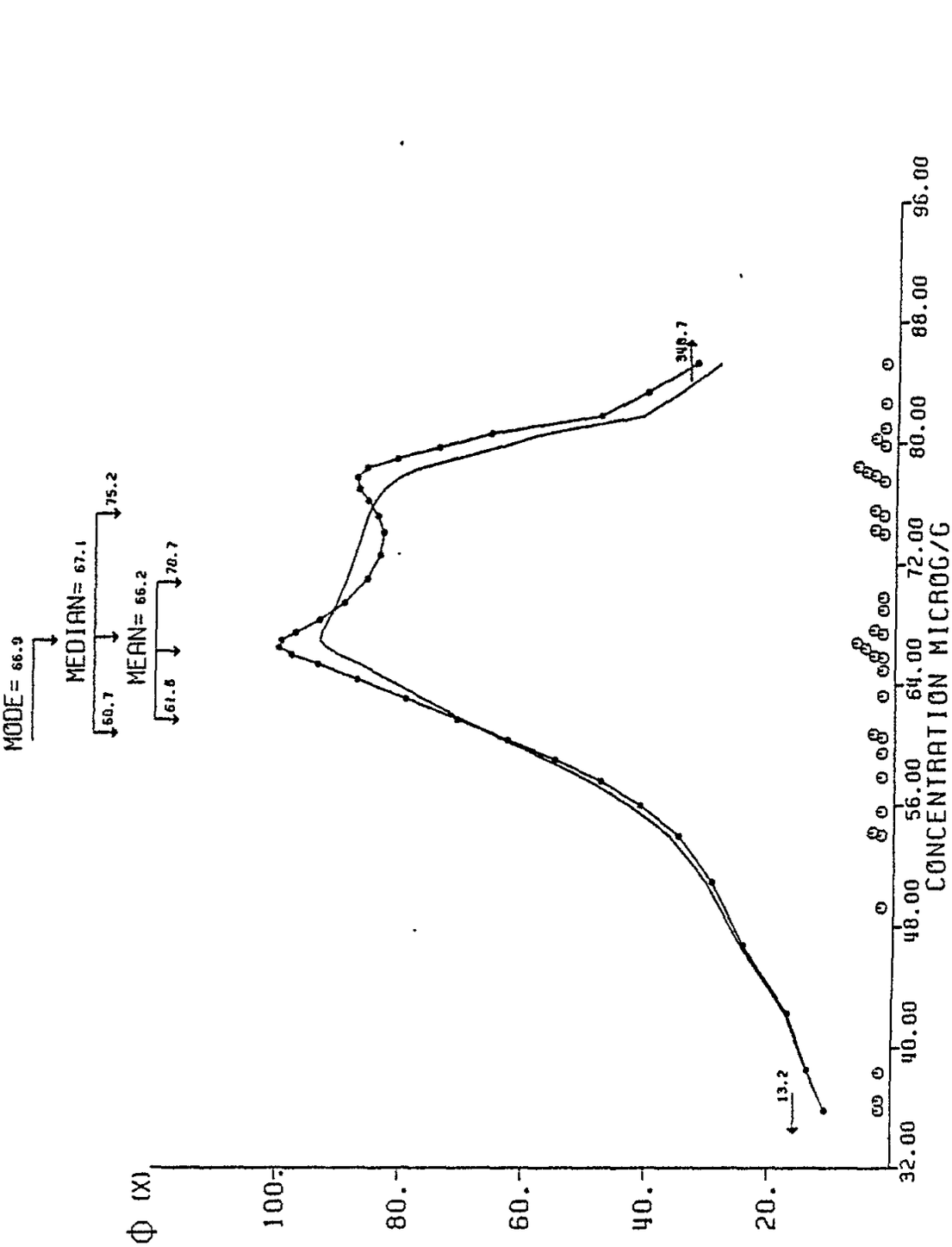
MN IN IAEA/RUN MA-M-2/TM
MODE= 66.9
MEDIAN= 67.1
60.7
75.2
MEAN= 66.2
61.6
70.7
Φ (X)
100.
80.
60.
40.
20.
13.2
348.7
32.00
40.00
48.00
56.00
64.00
72.00
80.00
88.00
96.00
CONCENTRATION MICROG/G

FIG.14

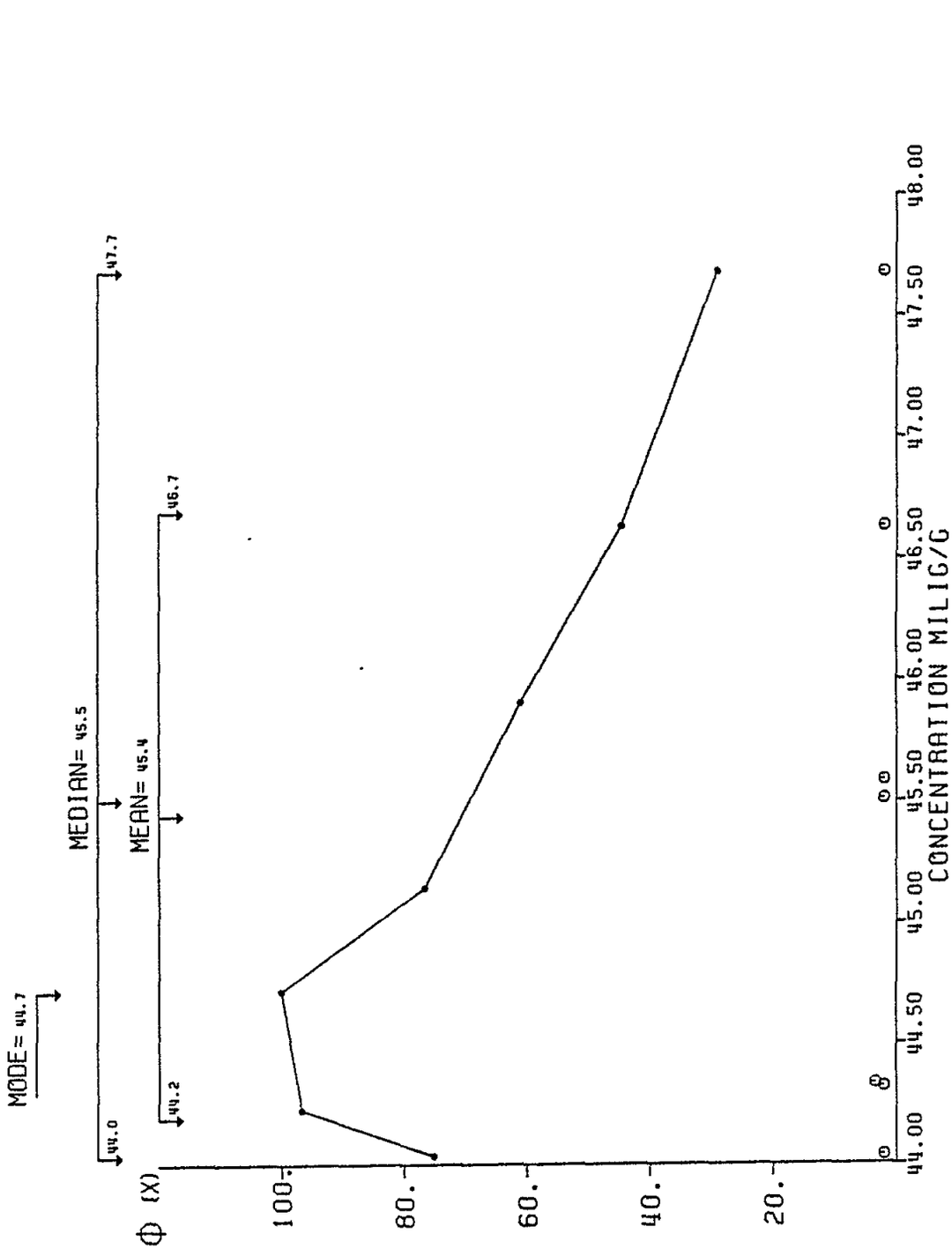
NA IN IAEA/RUN MA-M-2/TM
MODE= 44.7
MEDIAN= 45.5
MEAN= 45.4
44.0
44.2
46.7
47.7
Φ (X)
100.
80.
60.
40.
20.
44.00
44.50
45.00
45.50
46.00
46.50
47.00
47.50
48.00
CONCENTRATION MILIG/G

FIG. 15

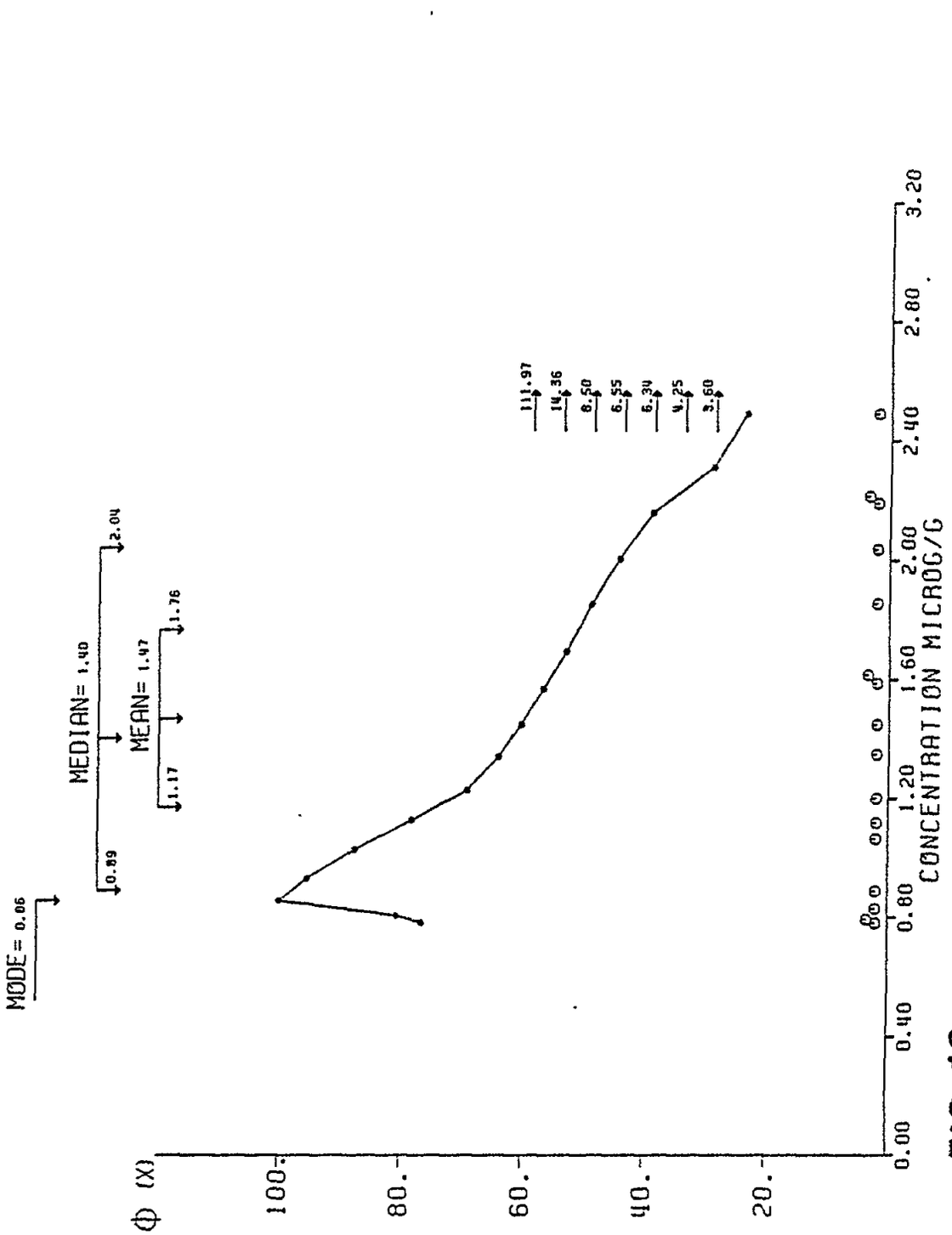
NI IN IAEA/RUN MA-M-2/TM
MODE= 0.06
MEDIAN= 1.40
0.89
2.04
MEAN= 1.47
1.17
1.76
111.97
14.36
8.50
6.55
6.34
4.25
3.60
Φ (X)
100.
80.
60.
40.
20.
0.00
0.40
0.80
1.20
1.60
2.00
2.40
2.80
3.20
CONCENTRATION MICROG/G

FIG. 16

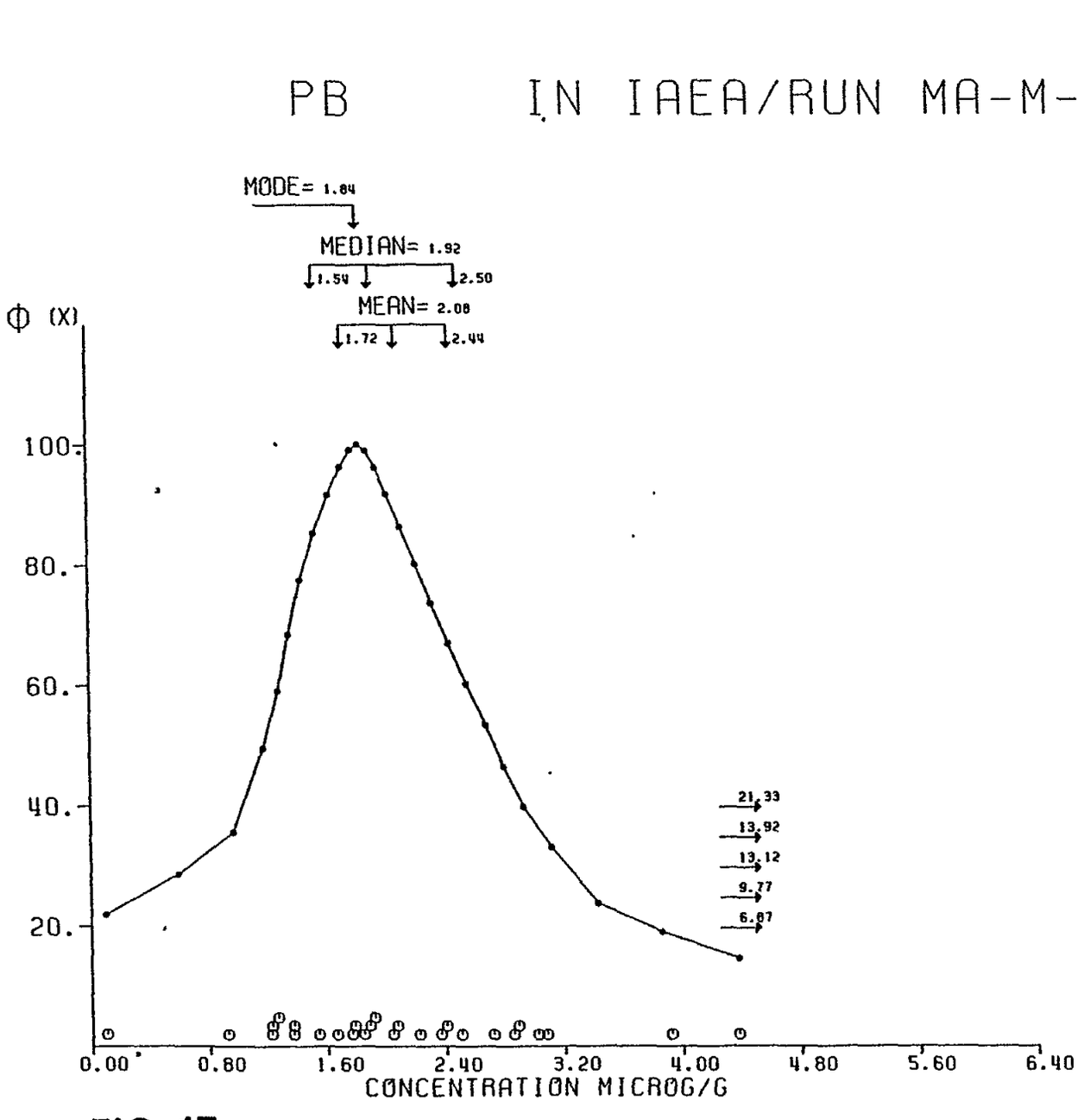
PB IN IAEA/RUN MA-M-2/TM
MODE= 1.84
MEDIAN= 1.92
1.54
2.50
MEAN= 2.08
1.72
2.44
Φ (X)
100.
80.
60.
40.
20.
21.33
13.92
13.12
9.77
6.87
0.00
0.80
1.60
2.40
3.20
4.00
4.80
5.60
6.40
CONCENTRATION MICROG/G

FIG. 17

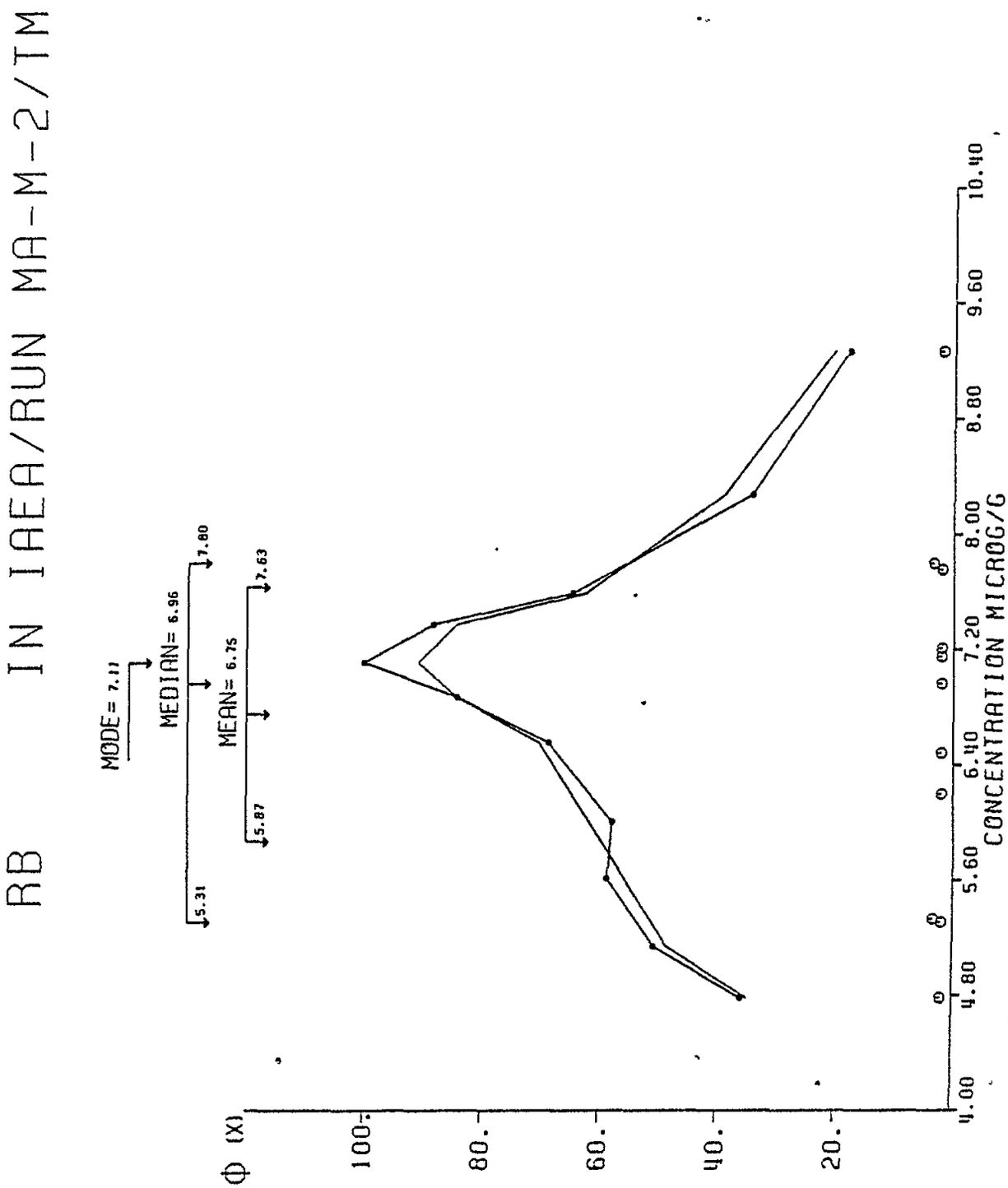
RB IN IAEA/RUN MA-M-2/TM
MODE= 7.11
MEDIAN= 6.96
MEAN= 6.75
7.80
7.63
5.87
5.31
Φ (X)
100.
80.
60.
40.
20.
4.00
4.80
5.60
6.40
7.20
8.00
8.80
9.60
10.40
CONCENTRATION MICROG/G

FIG.18

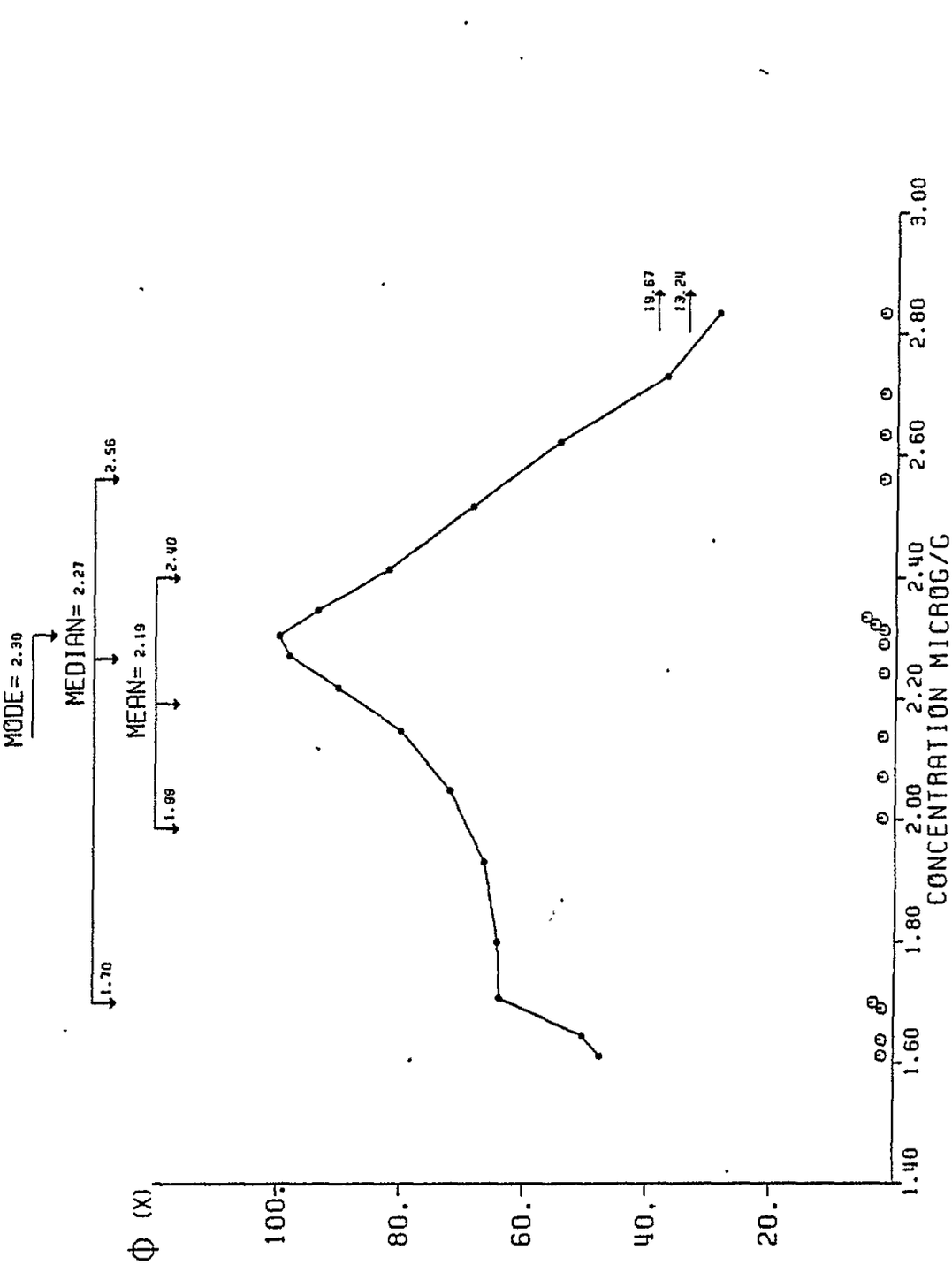
SE IN IAEA/RUN MA-M-2/TM.
MODE= 2.30
MEDIAN= 2.27
MEAN= 2.19
2.56
2.40
1.99
1.70
19.67
13.24
Φ (X)
100.
80.
60.
40.
20.
1.40
1.60
1.80
2.00
2.20
2.40
2.60
2.80
3.00
CONCENTRATION MICROG/G

FIG. 19

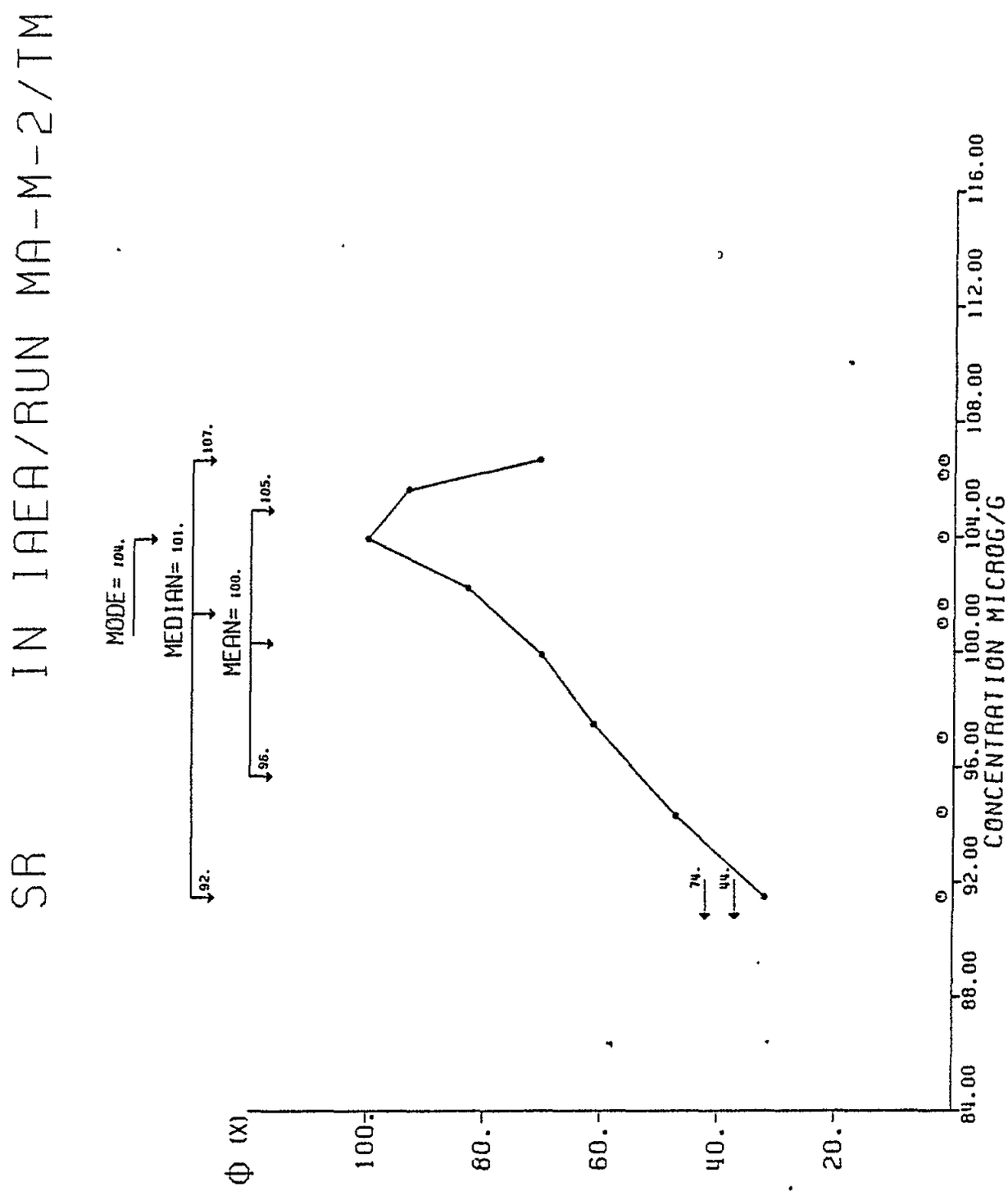
SR IN IAEA/RUN MA-M-2/TM
MODE= 104.
MEDIAN= 101.
MEAN= 100.
107.
105.
96.
92.
74.
44.
Φ (X)
100.
80.
60.
40.
20.
84.00
88.00
92.00
96.00
100.00
104.00
108.00
112.00
116.00
CONCENTRATION MICROG/G

FIG. 20

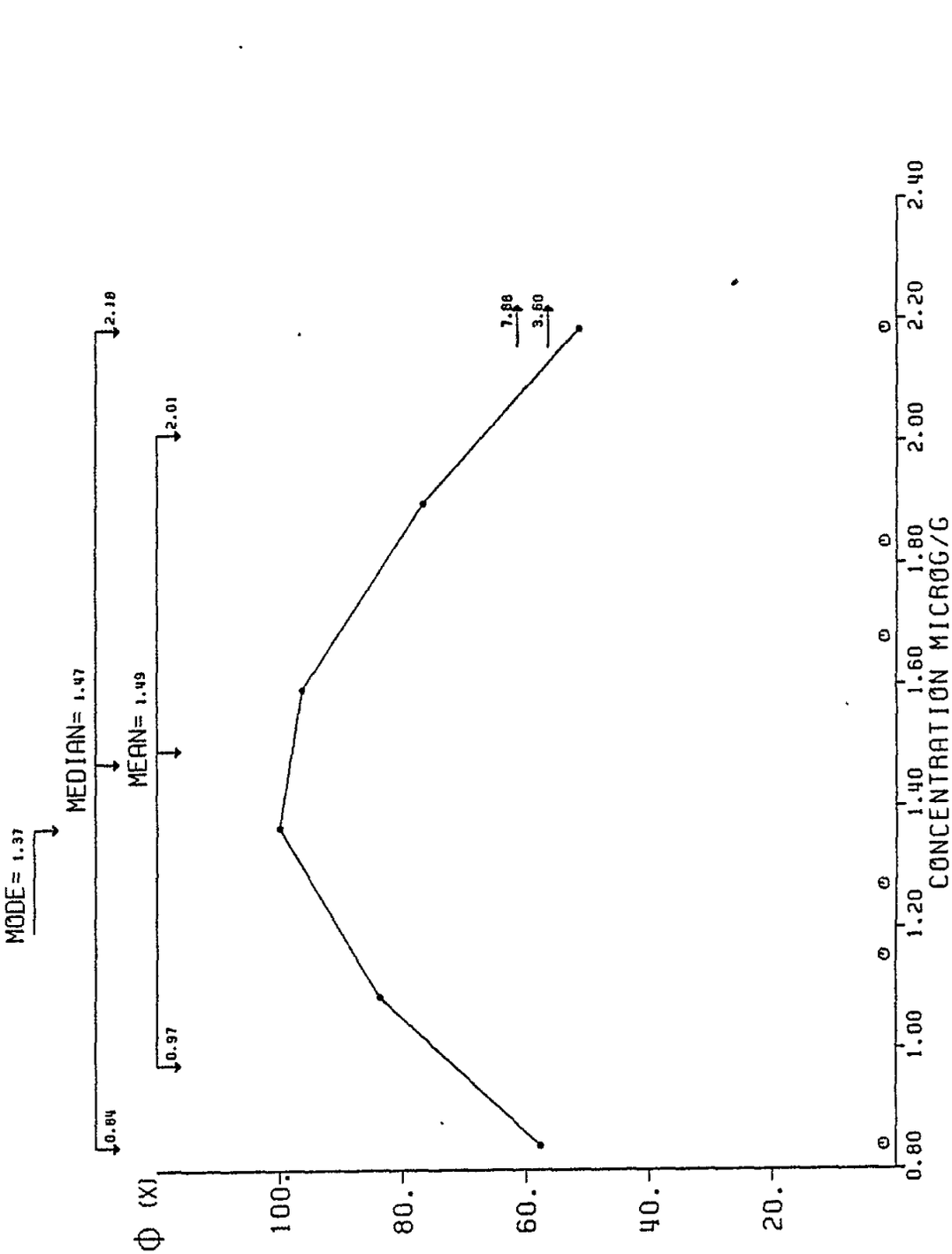
V IN IAEA/RUN MA-M-2/TM
MODE= 1.37
MEDIAN= 1.47
MEAN= 1.49
2.18
2.01
0.97
0.84
7.88
3.60
Φ (X)
100.
80.
60.
40.
20.
0.80
1.00
1.20
1.40
1.60
1.80
2.00
2.20
2.40
CONCENTRATION MICROG/G

FIG. 21

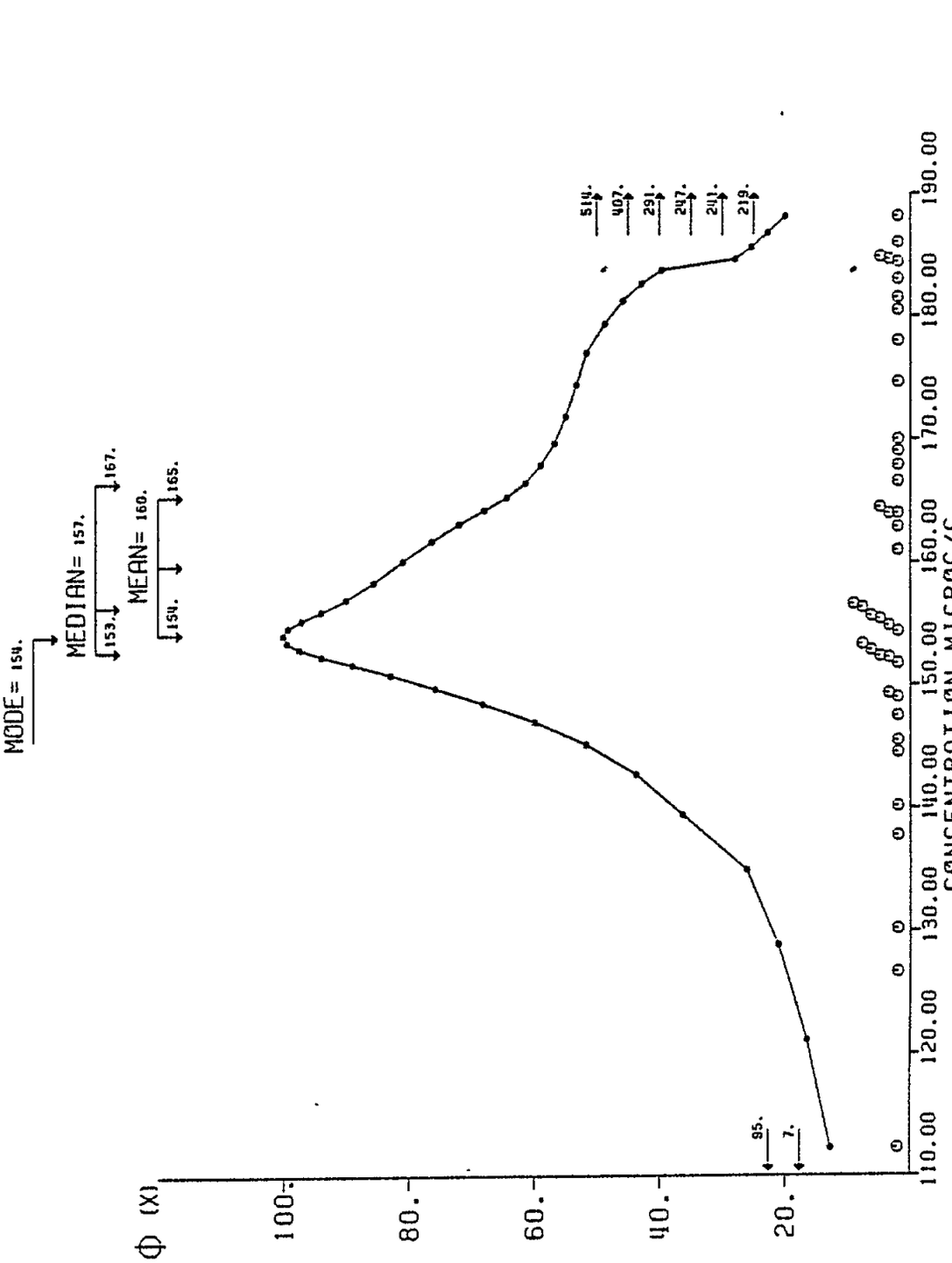
ZN IN IAEA/RUN MA-M-2/TM
MODE= 154.
MEDIAN= 157.
153.
167.
MEAN= 160.
154.
165.
Φ (X)
100.
80.
60.
40.
20.
95.
7.
514.
407.
291.
247.
241.
219.
110.00
120.00
130.00
140.00
150.00
160.00
170.00
180.00
190.00
CONCENTRATION MICROG/G

FIG. 22

List of participants in the Intercomparison MA-M-2/TM
(in alphabetical order by country)

Dr. S.B. Adeloju
Division of Chemical and Physical Sciences, Deakin University,
Waurn Ponds, Geelong, Victoria 3217, Australia

Dr. R. De Borger and Mr. P. Van Hoeyweghen
Institut de Recherches Chimiques, Museumlaan 5,
B-1980 Tervuren, Belgium

Prof. Dr. H. Deelstra and Mr. O. Van Schoor
Department of Pharmaceutical Sciences, Universitaire instelling
Antwerpen, Universiteitsplein, 1, B-2610 Wilrijk, Belgium

Dr. D. Apostolov
Bulgarian Academy of Sciences, Institute for Nuclear Research and
Nuclear Energy, Boul. Lenin 72, Sofia 1184, Bulgaria

Mr. C. Desjardins, Regional Chemist,
Governemnt of Canada Fisheries and Oceans
1001 Pierre Dupuy Street, Longueuil, Quebec J4K1A1, Canada

Mrs. M. Hendzel
Department of Fisheries and Oceans, 501, University Crescent,
Winnipeg, Manitoba, R3T2N6, Canada

Dr. R. Holowaty
Environment Canada, Pacific Region (EPS-FMS)
4195 Marine Drive, West Vancouver, B.C., V7V1N8, Canada

Mr. L.W. Prokopanko and Mr. W.M. Ward
Technical Services Laboratory,
745 Logan Av., Winnipeg, Manitoba, R3E3L5, Canada

Messrs. Luo Shi-Hua, Ji Guo-Kun, Xu Ying-Pu, Jiang Yong
Institute of High Energy Physics, Academia Sinica,
P.O.Box 2732, Peking, The People's Republic of China

Mr. H. Gomez Gomez
Instituto de Asuntos Nucleares
Apartado Aéréo 8595, Bogotá, Colombia

Dr. S. Bartha
Institute of Radioecology and Applied Nuclear Techniques
P.O. Box A-41, 04061 Košice, Czechoslovakia

Dr. S. Zima, Ing. O. Čelechovská
University School of Vet. Med., Dept. of Chemistry,
61242 Brno, Palackého 1-3, Czechoslovakia

Messrs. N.J. Larsen and J.C. Tjell
Dept. of Environmental Engineering, Technical University of Denmark,
Building 115, DK-2800 Lyngby, Denmark

Dr. M. Perttilä
Institute of Marine Research
P.O. Box 33, SF-00931 Helsinki 93, Finland

Mr. S. Salmela
Department of Public Health Science, University of Helsinki,
Haartmaninkatu 3, SF-00290 Helsinki 29, Finland

Dr. M. Aubert and Mrs. S. Mathonnet
Centre d'Etudes et de Recherche de Biologie et d'Océanographie
Médicale, 1, Av. Jean Lorrain, F-06000 Nice, France

Dr. G. Cumont, Directeur de Recherches,
Laboratoire Central d'Hygiène Alimentaire,
43, rue de Dantzig, F-75015 Paris, France

Mr. F. Fedoroff
C.N.R.S., Centre d'Etudes de Chimie Métallurgique,
15, rue Georges Urbain, F-94400 Vitry-sur-Seine, France

Dr. J.P. Garrec
CEA-CENG, Département de Recherche Fondamentale, Laboratoire
de Biologie Végétale, F-38041 Grenoble Cedex, France

OMR Prof. Dr. Sc. Med. Bittersohl and Dr. M. Roschig
Arbeitshygienisches Zentrum der Chemischen Industrie,
PSF 31, 422 Leuna 3, German Democratic Republic

Dr. P. Neske, Ing. L. Dornheim
Bezirks-Hygieneinspektion und -institut Magdeburg,
Postfach 317, 3040 Magdeburg, German Democratic Republic

Dr. L. Greim
GKSS Forschungszentrum, Institut für Physik,
Postfach 1160, D-2054 Geesthacht, Federal Republic of Germany

Dr. U. Kurfürst and Mr. K.M. Grobecker
Grün-Analysengeräte, Solmserstr. 90,
D-6330 Wetzlar, Federal Republic of Germany

Dr. T. Liese
Kernforschungszentrum Karlsruhe GmbH, Hauptabteilung Sicherheit,
Postfach 3640, D-7500 Karlsruhe 1, Federal Republic of Germany

Messrs. K. Weiler and R.D. Wilken
GKSS Forschungszentrum, Institut für Chemie,
Postfach 1160, D-2054 Geesthacht, Federal Republic of Germany

Dr. J. Bacsó
Institute of Nuclear Research of the Hung. Acad. of Sciences,
POB 51, H-4001 Debrecen, Hungary

Dr. P. Fodor
Chemical Department of the University for Horticulture,
H- Budapest 1502, Villányi út 29-31, Hungary

Messrs. R.S. Iyer and I.S. Bhat
Environmental Survey Laboratory, TAPS Colony,
TAPS Post, Thana, Dist. PIN 401504, Maharashtra, India

Prof. R. Nath and Mr. P.J. Singh
Department of Biochemistry, Postgraduate Institute of Medical
Education and Research, Chandigarh 160012, India

Dr. V.K. Panday
Health Physics Division, Low-level Laboratory,
BARC Hospital Complex, Bombay-94, India

Dr. F. Ferri
Unita Sanitaria Locale, N.3 - Imperiese,
Via S. Agata, 31, I-18100 Imperia, Italy

Dr. G. Ingrao
Laboratorio Ecologia Continentale e Diffusione Atmosferica,
ENEA-CRE Casaccia, C.P. 2400, I-00100 Roma, Italy

Dr. Abdul Aziz and Mr. Ali M. Sabet
Kuwait Institute for Scientific Research,
P.O.Box 24885, Safat, Kuwait

Mr. B. Oregioni
International Laboratory of Marine Radioactivity,
Oceanographic Museum, MC-98000 Monaco

Messrs. A. Veglia and D. Bezard
Centre Scientifique de Monaco,
Musée Océanographique, MC-98000 Monaco

Mr. J. Nieuwenhuize
Delta Institute for Hydrobiological Research,
Vierstraat 28, 4401 EA Yerseke, The Netherlands

Dr. J. Lee
Applied Biochemistry Division,
D.S.I.R., Palmerston North, New-Zealand

Messrs. O. Johansen and J.P. Rambaek
Institute for Energy Technology,
Box 40, N-2007 Kjeller, Norway

Dr. A. Mannan
Pakistan Institute of Nuclear Science and Technology,
P.O. Nilore, Rawalpindi, Pakistan

Doc. Dr. Habil. R. Dybczyński
Dept. of Analytical Chemistry, Institute of Nuclear Chemistry and Technology, 03-195 Warszawa, Ul. Dorodna 16, Poland

Dr. J Janczyszyn
Institute of Nuclear Physics and Techniques, University of Mining and Metallurgy, 30-059 Kraków, Al. Mickiewicza 30, Poland

Dr. J. Kajfosz
Institute of Nuclear Physics,
Radzikowskiego 152, 31-342 Cracow, Poland

Dr. M. Michalewska
Institute of Inorganic Chemistry and Metallurgy of Rare Elements, Technical University, St. Wyspiańskiego 27, 50-370 Wroclaw, Poland

Dr. M. Salagean
Institute for Physics and Nuclear Engineering,
P.O.Box 5206, Bucharest 76900, Romania

Dr. G.A. Eagle
National Research Institute for Oceanology,
P.O.Box 320, Stellenbosch 7600, South Africa

Messrs. J. Henry and G.N. Davis
Sea Fisheries Research Institute,
Private Bag X2, Rogge Bay 8012, South Africa

Mr. M.C.B. Smit
Chemistry Division, Nuclear Development Corporation of South Africa (PTY), Ltd., Private Bag X256, Pretoria 0001, South Africa

Dr. R.C. Stanton
National Institute for Water Research,
P.O.Box 17001, Congella 4013, Natal, South Africa

Dr. R.J. Watling and Mr. M.M. Talbot
Marine Pollution Group, Zoology Dept., University of Port Elizabeth,
P.O.Box 1600, Port Elizabeth 6000, South Africa

Messrs. J.A. Cocho de Juan and J.M. Fraga
Clinica Universitaria de Pediatria, Hospital General de Galicia,
Apartado 149, Santiago de Compostela, Spain

Messrs. M. Dejkumhang and N. Leelhaphunt
Office of Atomic Energy for Peace,
Thanon Vibhavadee-Rangsit, Bangkhen, Bangkok 10900, Thailand

Dr. Ahmet Bayülken
Çekmece Nuclear Research and Training Center
P.K.1 Havaalani, Istanbul, Turkey

Dr. J.G. Farmer
Department of Forensic Medicine and Science, University of Glasgow,
Glasgow G128QQ, Scotland, United Kingdom

Dr. M.V. Meech
Laboratory of the Government Chemist, Cornwall House,
Stamford Street, London SE1 9NQ, England, United Kingdom

Dr. N.P. Morozov
All-Union Research Institute of Marine Fisheries and Oceanography
(VNIRO), 17, v. Krasnoselskaya, Moscow, B-140, 107140, U.S.S.R.