ENVIRONMENT AGENCY AUSTRIA umweltbundesamt

INTERLABORATORY COMPARISON EVALUATION

Organotin Compounds – OZ1

Sample dispatch on 18th November 2014

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Dr. Sigrid Scharf

Table of contents

1 Interlaboratory comparison Organotin Compounds – OZ1

1.1 Participants and time schedule

- Number of registrations: 9
- Number of submitted data records: 9
- Dispatch of samples: 18th November 2014
- Closing date for submission of data: 16th December 2014, postponed to 18th December 2014

To anonymise results, each laboratory was given a laboratory code on a random basis.

1.2 Sampling, sample material and distribution

One groundwater sample and one waste water sample was selected as sample material. The sampling was carried out on 16th and 17th November 2014. The samples were stored at < 4 °C until further processing. The samples were partly spiked with specific substances. The samples were filled into bottles with continuous stirring. The homogeneous mixtures were dispatched on 18th November 2014. Each participant received:

- 2 samples, filled in 1000 ml glass bottles

1.3 Check analysis

While filling the bottles, aliquots of each sample were collected at random moments for check analysis. Testing was performed 2 days after sample dispatch.

In the parameter-oriented evaluation, the results of the check testing are listed in the form of arithmetic means of the detected concentrations as check value ± U The uncertainties of the check value were calculated as extended uncertainties (k=2).

2 Evaluation

The analytical results had to be made available to the organiser not later than 18th December 2014. Any values received at a later date were not considered. A statistical evaluation of interlaboratory comparison data was only carried out if at least 6 valid results per parameter were available.

To evaluate the data, outliers were detected first by using the outlier test method according to Hampel. Values identified as conspicuous by this test method are marked specifically in the parameter-oriented evaluation. Further evaluation was performed in accordance with DIN ISO 5725-2. The adjusted average value (after removal of outliers) for all submitted results was used as a basis for the calculation of recovery rates.

z-Score

z-Scores were calculated on the basis of the following formula:

$$z - score = \frac{x_i - \overline{X}}{\sigma}$$

In this context,

x_i is the measurement value of the participating laboratory.

$\overline{X}$ is the adjusted average value (i.e. after removal of outliers) of the participants' results.

σ is the reproducibility standard deviation, calculated from the participants' results (after removal of outliers) in the relevant test round.

Interpretation of z-Scores in the parameter-oriented evaluation:

- |z| < 2: result: good
- 2 < |z| < 3 result: questionable
- |z| > 3 result: not satisfactory

3 Representation and interpretation of measurement results

The parameter-oriented evaluation shows the measurement values including uncertainty, recovery rate, calculated z-Score and the outliers in tabular form. The results listed in the table are also illustrated in graphical form (see 5 Explanatary notes on the parameter oriented report)

4 Explanatory notes

As explained in evaluation (page 5), the z-score is calculated using the reproducibility standard deviation, calculated from the participants' results (after removal of outliers) in the relevant test round. As a consequence of this it might occur that the z-score between -2 and 2 covers an extraordinary range, due to a high variance of the results.

Due to the small number and the high variance of the results of diphenyltin cation at sample OZ1 A we abstained a further evaluation.

5 Explanatory notes on the parameter oriented report

Mean ± CI (99%)	***Mean of the participants results, without outliners ± 99% confidence interval***
Minimum – Maximum	***Minimum and maximum of all submitted results, after removal of outliners***
Check value ± U	***Mean of check value ± expanded uncertainty (k=2)***

Labcode	Result	± U	Recovery [%]	z-score	Comments
LC0001	0.015	0.0001	89. 7	-0.5	
LC0002	0.0148	0.003	88. 5	0.6	
LC0003	-	-	-	-	
LC0004	-	-	-	-	
. . .					
LC0009	0.100	0.01	597.9	24.2	H

Symbols and abbreviations:

± U Results uncertainty as indicated by participant

\- *No data available*

Possible remarks in the column comments:

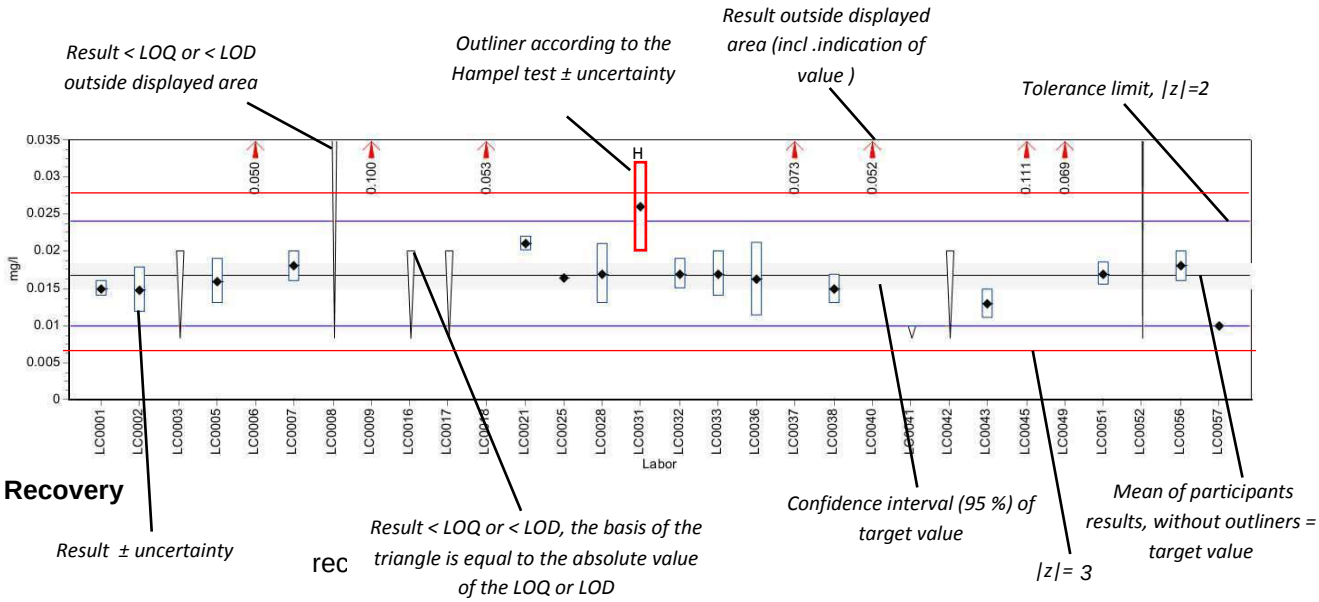
H Outliner according to Hampel-Test

FN False negative – For a result < LOQ (level of quantification): The absolute value of the LOD/LOQ fulfils the condition of an outliner according to the Hampel test.

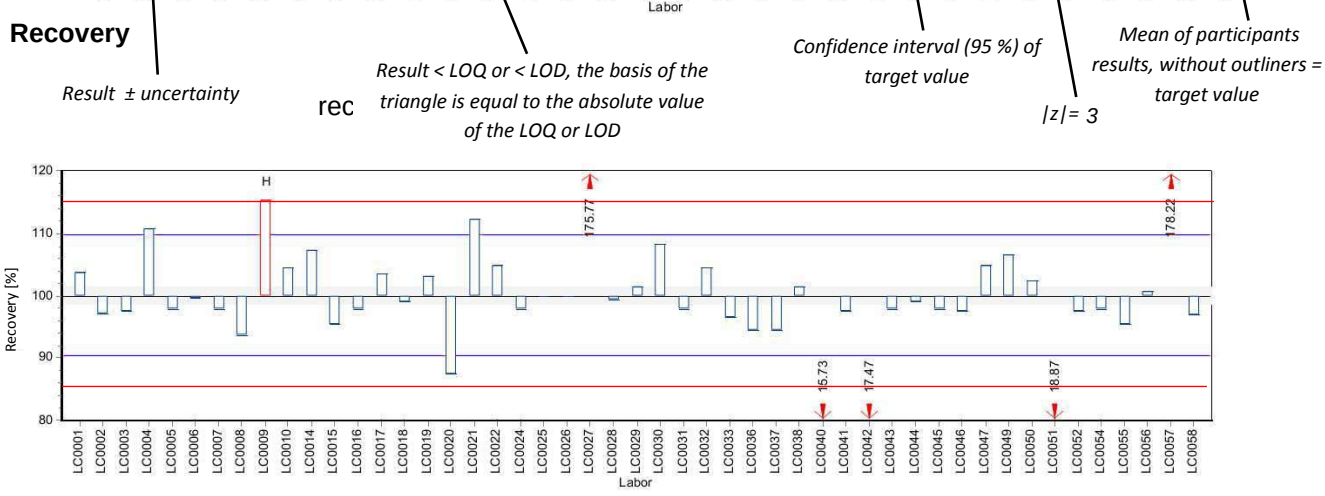
FP False positive – For parameters where no target value is available because of a too low analyte content (n < 6): Result that exceeds the median of the absolute values of the transmitted LOD/LOQs by more than 100 %.

Graphical presentation of results

Results

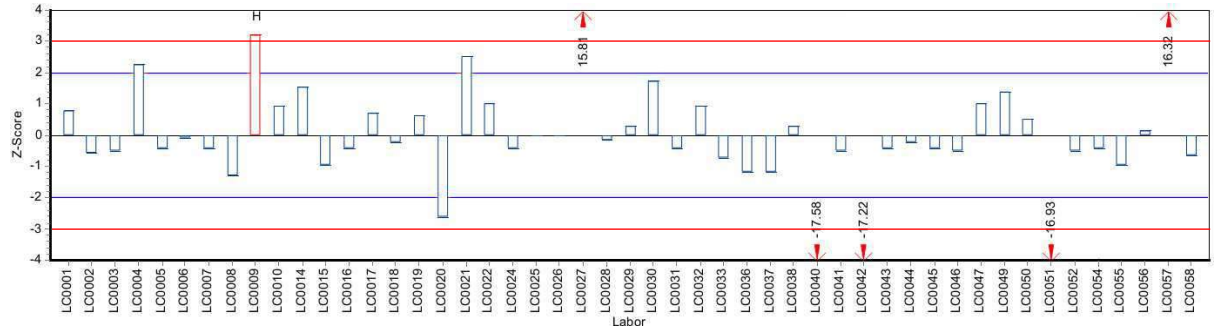


Recovery



z-Score

Presentation of results as z-scores.



6 Summary of results, after removal of outliers

Parameter	Sample	Unit	Number of results for calculation	Number of outliners	Mean	±	CI (99%)	Minimum	Maximum	SD	RSD
Monobutyltin cation	OZ1 A	ng/l	8	0	36.3	±	24.4	9.4	69.6	23	63.4
	OZ1 B	ng/l	4	1	-	±	-	1.01	7.2	-	-
Dibutyltin cation	OZ1 A	ng/l	8	0	17.6	±	9.38	6	30	8.85	50.2
	OZ1 B	ng/l	7	0	4.25	±	3.71	0.73	10	3.28	77
Tributyltin cation	OZ1 A	ng/l	2	0	-	±	-	0.26	0.38	-	-
	OZ1 B	ng/l	5	1	-	±	-	0.575	5.3	-	-
Tetrabutyltin cation	OZ1 A	ng/l	1	0	-	±	-	0.16	0.16	-	-
	OZ1 B	ng/l	6	0	1.76	±	0.742	1.24	2.9	0.606	34.4
Diphenyltin cation	OZ1 A	ng/l	3	0	-	±	-	11	874	-	-
	OZ1 B	ng/l	-	-	-	±	-	-	-	-	-
Triphenyltin cation	OZ1 A	ng/l	7	0	21.3	±	12.3	7.7	38	10.8	50.8
	OZ1 B	ng/l	6	1	2.43	±	1.23	0.75	3.8	1	41.4

7 Parameter oriented report

Parameter oriented report

OZ1 A

Monobutyltin cation

Unit	ng/l
Mean ± Cl (99%)	36.3 ± 24.4
Minimum - Maximum	9.4 - 69.6
Check value ± U	28 ± 7.2

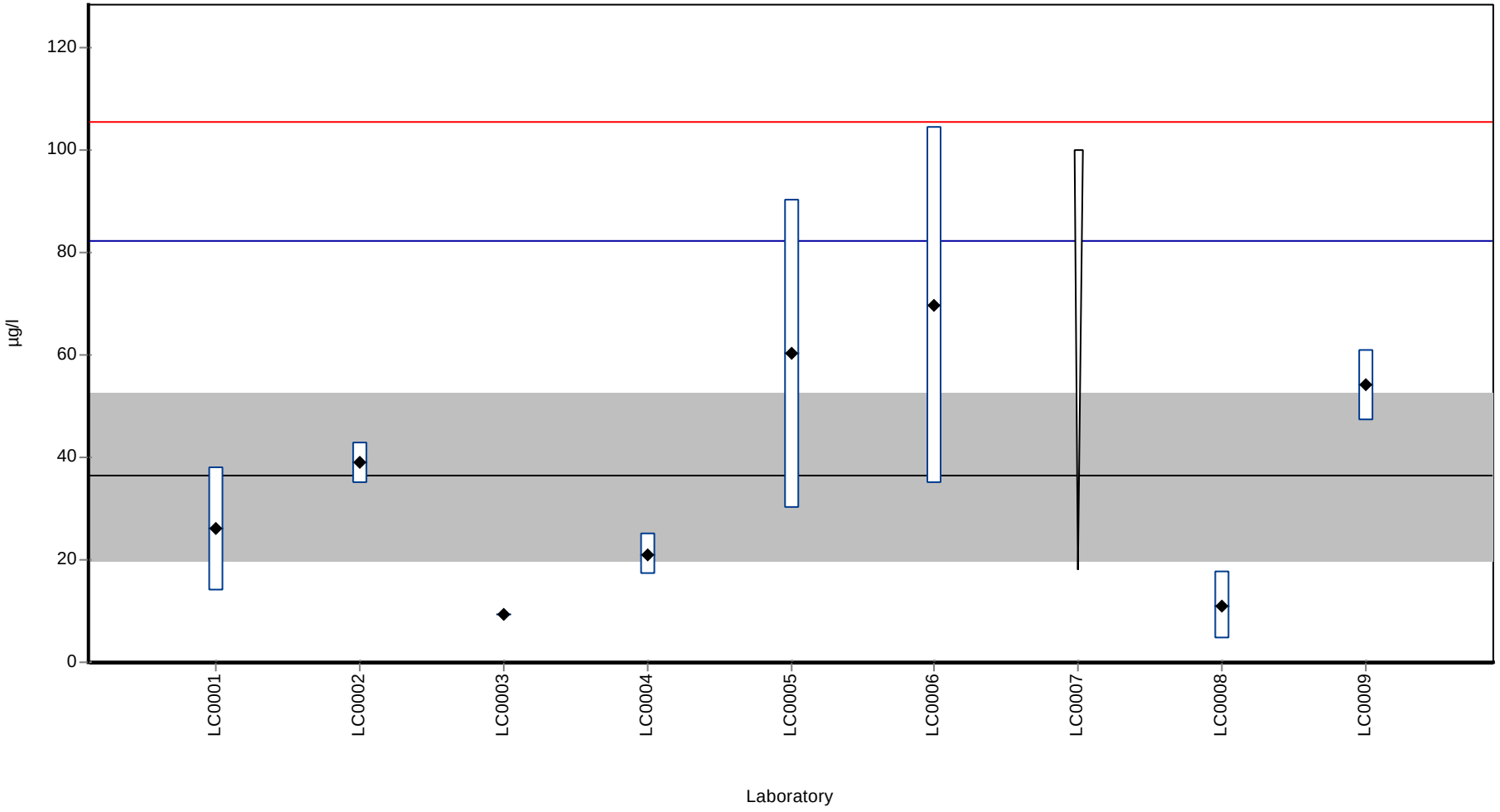
Labcode	Result	± U	Recovery [%]	z-score	Comments
LC0001	26.000	12.000	71.7	-0.4	
LC0002	38.900	4.100	107.2	0.1	
LC0003	9.400	-	25.9	-1.2	
LC0004	21.000	4.000	57.9	-0.7	
LC0005	60.230	30.120	166.0	1.0	
LC0006	69.600	34.800	191.8	1.4	
LC0007	< 100 (LOQ)	-	-	-	
LC0008	11.100	6.600	30.6	-1.1	
LC0009	54.000	7.000	148.8	0.8	

Characteristics of parameter

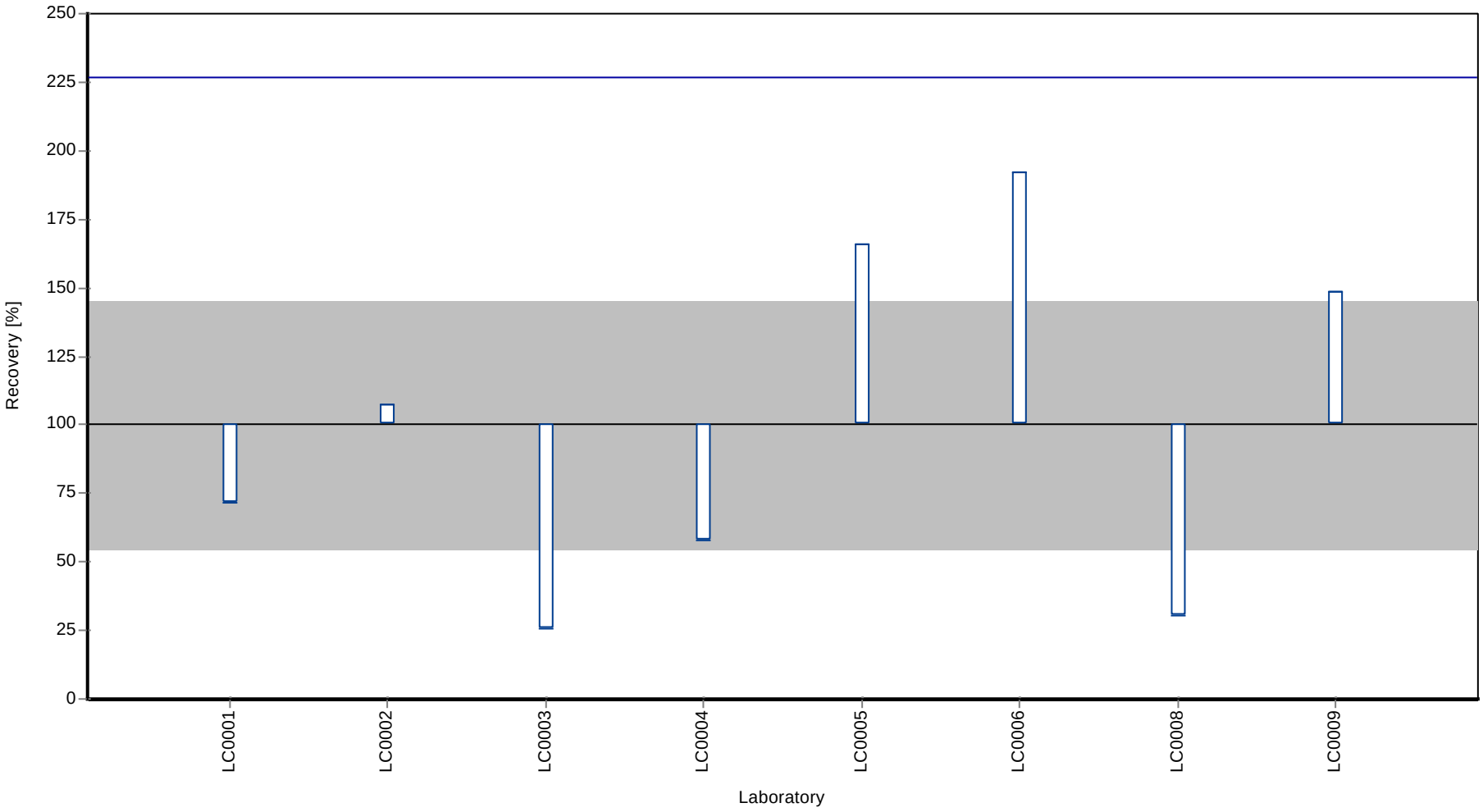
	all results	without outliners	Unit
Mean ± Cl (99%)	36.3 ± 24.4	36.3 ± 24.4	ng/l
Minimum	9.4	9.4	ng/l
Maximum	69.6	69.6	ng/l
Standard deviation	23	23	ng/l
rel. Standard deviation	63.4	63.4	%
n	8	8	-

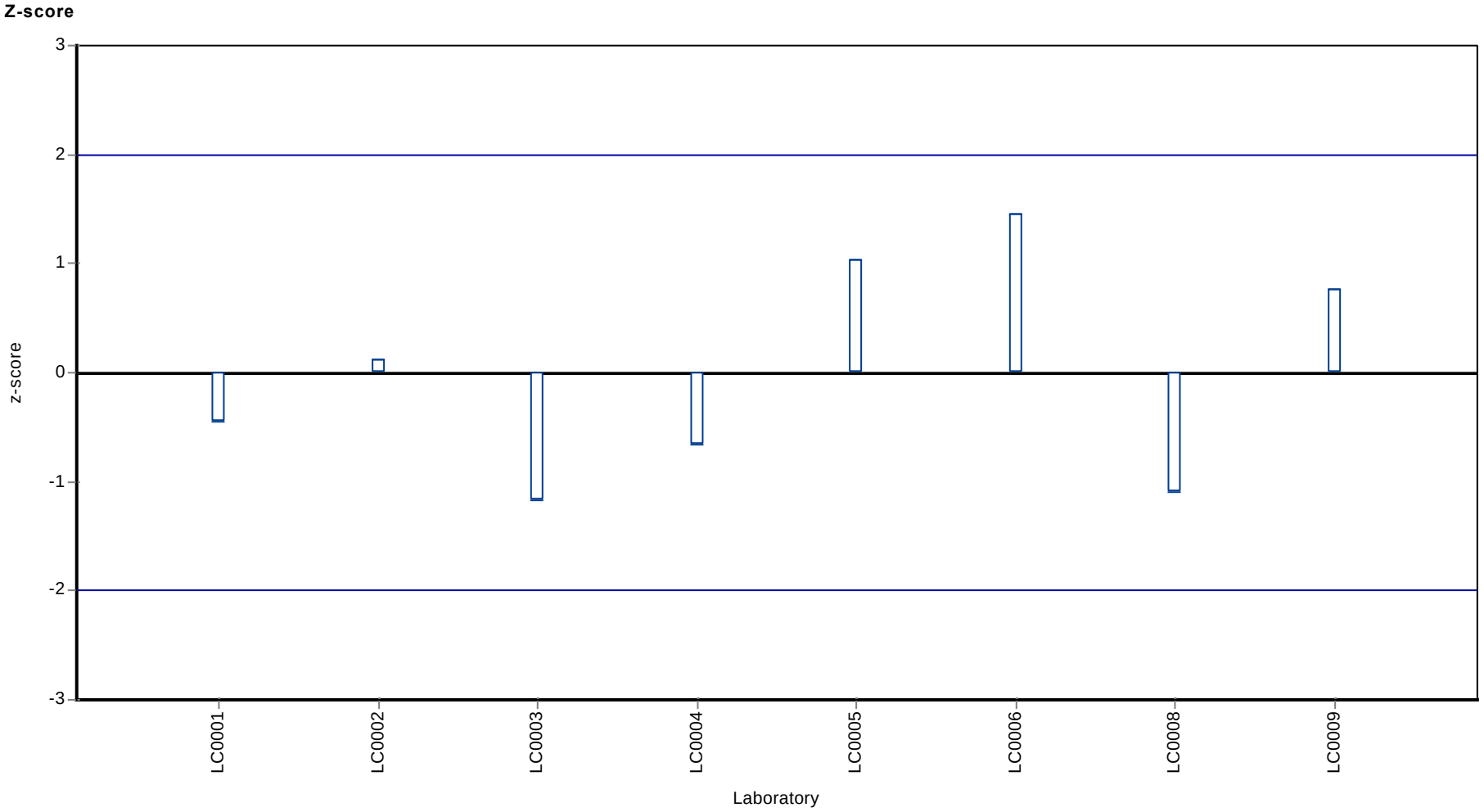
Graphical presentation of results

Results



Recovery rate




Z-score
3
2
1
0
-1
-2
-3
z-score
LC0001
LC0002
LC0003
LC0004
LC0005
LC0006
LC0008
LC0009
Laboratory

Parameter oriented report

OZ1 B

Monobutyltin cation

Unit	ng/l
Mean ± Cl (99%)	-
Minimum - Maximum	1.01 - 7.2
Check value ± U	1.3 ± 0.46

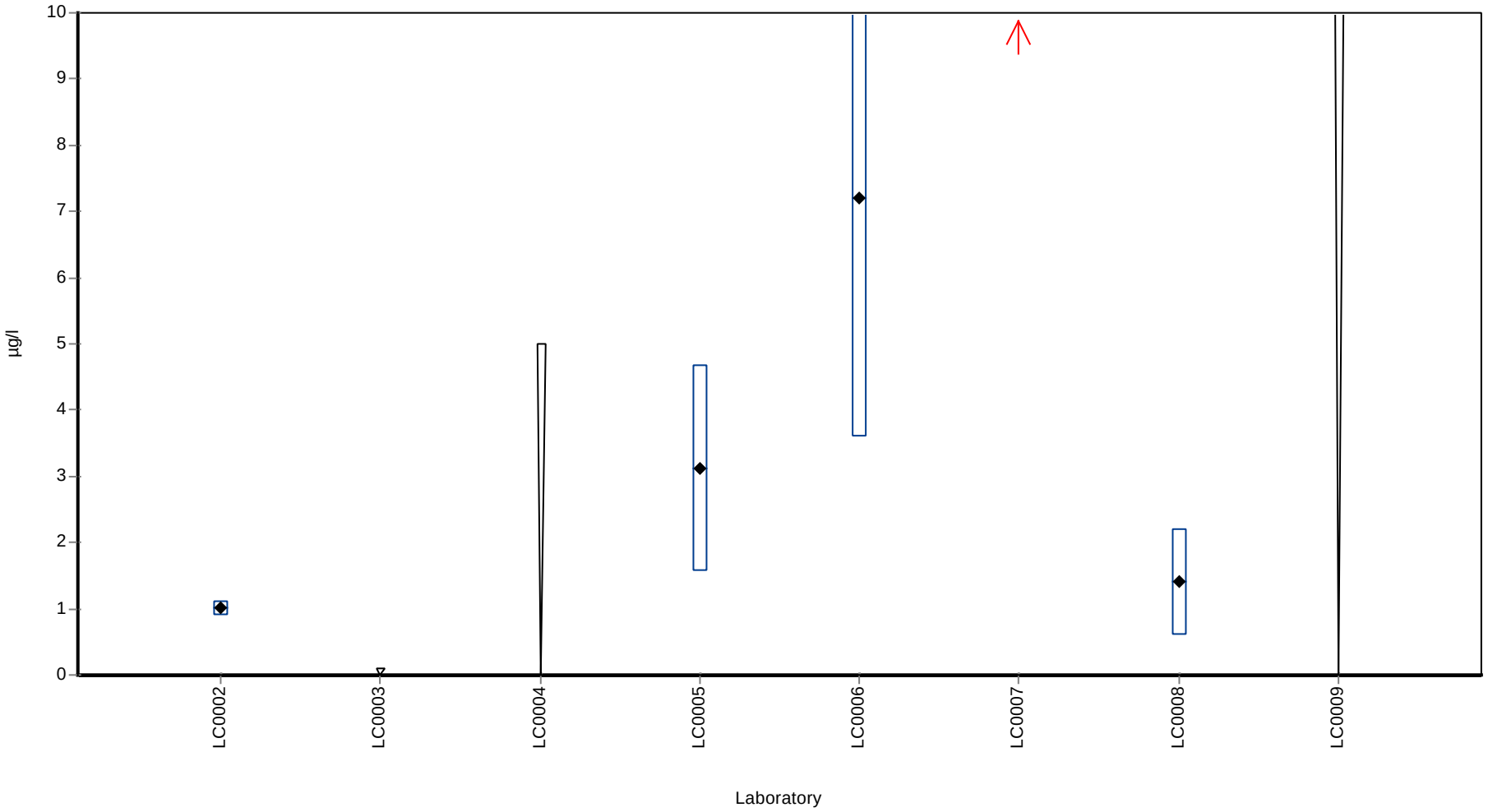
Labcode	Result	± U	Recovery [%]	z-score	Comments
LC0001	-	-	-	-	
LC0002	1.010	0.110	-	-	
LC0003	< 0.1 (LOQ)	-	-	-	
LC0004	<5 (LOD)	-	-	-	
LC0005	3.120	1.560	-	-	
LC0006	7.200	3.600	-	-	
LC0007	30.000	13.000	-	-	FP
LC0008	1.400	0.800	-	-	
LC0009	< 10 (LOQ)	-	-	-	

Characteristics of parameter

	all results	without outliners	Unit
Mean ± Cl (99%)	8.55 ± 16.4	-	ng/l
Minimum	1.01	1.01	ng/l
Maximum	30	7.2	ng/l
Standard deviation	12.2	-	ng/l
rel. Standard deviation	143	-	%
n	5	4	-

Graphical presentation of results

Results



Parameter oriented report

OZ1 A

Dibutyltin cation

Unit	ng/l
Mean ± Cl (99%)	17.6 ± 9.38
Minimum - Maximum	6 - 30
Check value ± U	14 ± 3.8

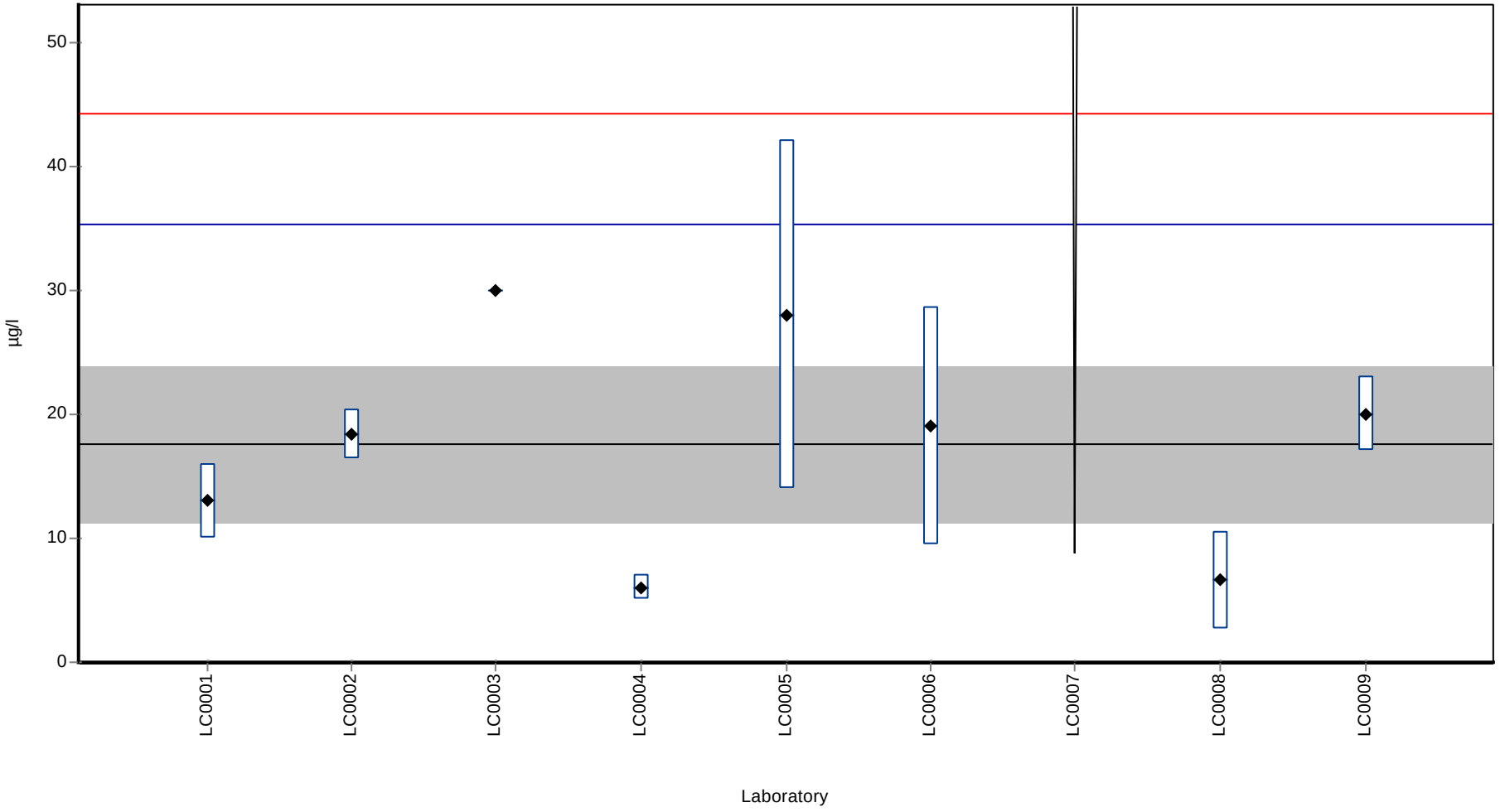
Labcode	Result	± U	Recovery [%]	z-score	Comments
LC0001	13.000	3.000	73.7	-0.5	
LC0002	18.400	2.000	104.3	0.1	
LC0003	30.000	-	170.1	1.4	
LC0004	6.000	1.000	34.0	-1.3	
LC0005	28.030	14.015	158.9	1.2	
LC0006	19.100	9.600	108.3	0.2	
LC0007	< 100 (LOQ)	-	-	-	
LC0008	6.600	3.900	37.4	-1.2	
LC0009	20.000	3.000	113.4	0.3	

Characteristics of parameter

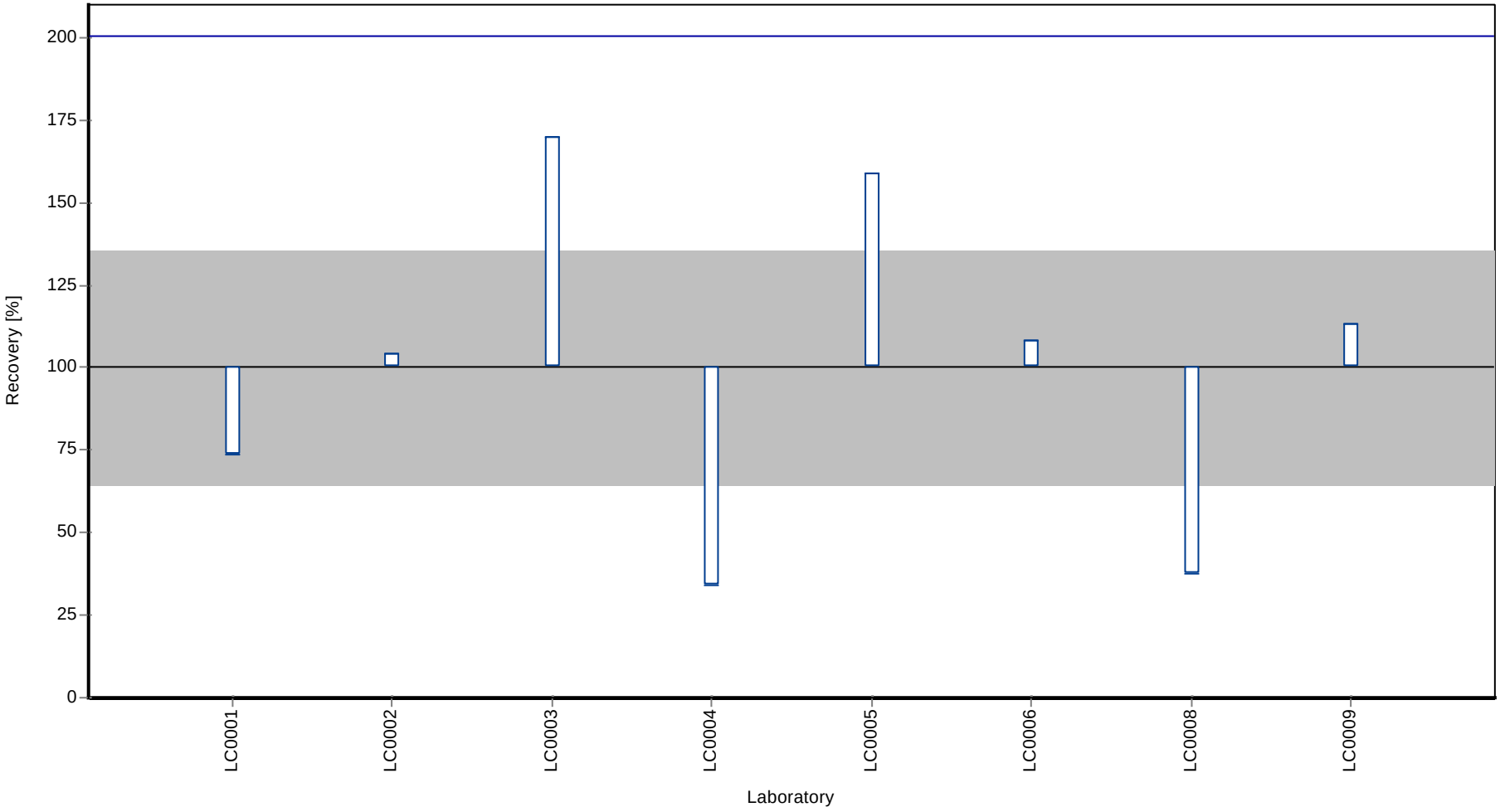
	all results	without outliners	Unit
Mean ± Cl (99%)	17.6 ± 9.38	17.6 ± 9.38	ng/l
Minimum	6	6	ng/l
Maximum	30	30	ng/l
Standard deviation	8.85	8.85	ng/l
rel. Standard deviation	50.2	50.2	%
n	8	8	-

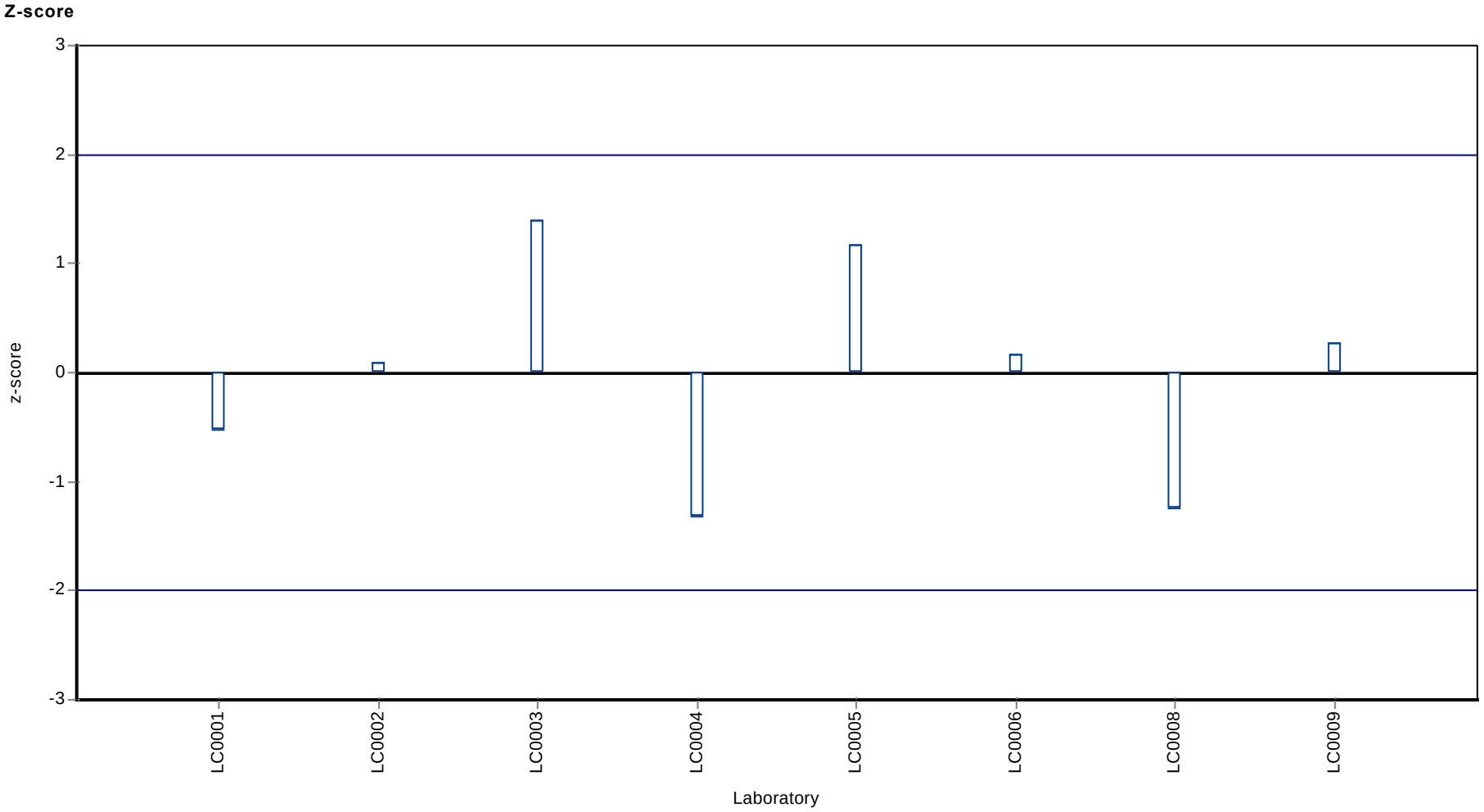
Graphical presentation of results

Results



Recovery rate




Z-score
3
2
1
0
-1
-2
-3
z-score
LC0001
LC0002
LC0003
LC0004
LC0005
LC0006
LC0008
LC0009
Laboratory

Parameter oriented report

OZ1 B

Dibutyltin cation

Unit	ng/l
Mean ± Cl (99%)	4.25 ± 3.71
Minimum - Maximum	0.73 - 10
Check value ± U	2.3 ± 0.43

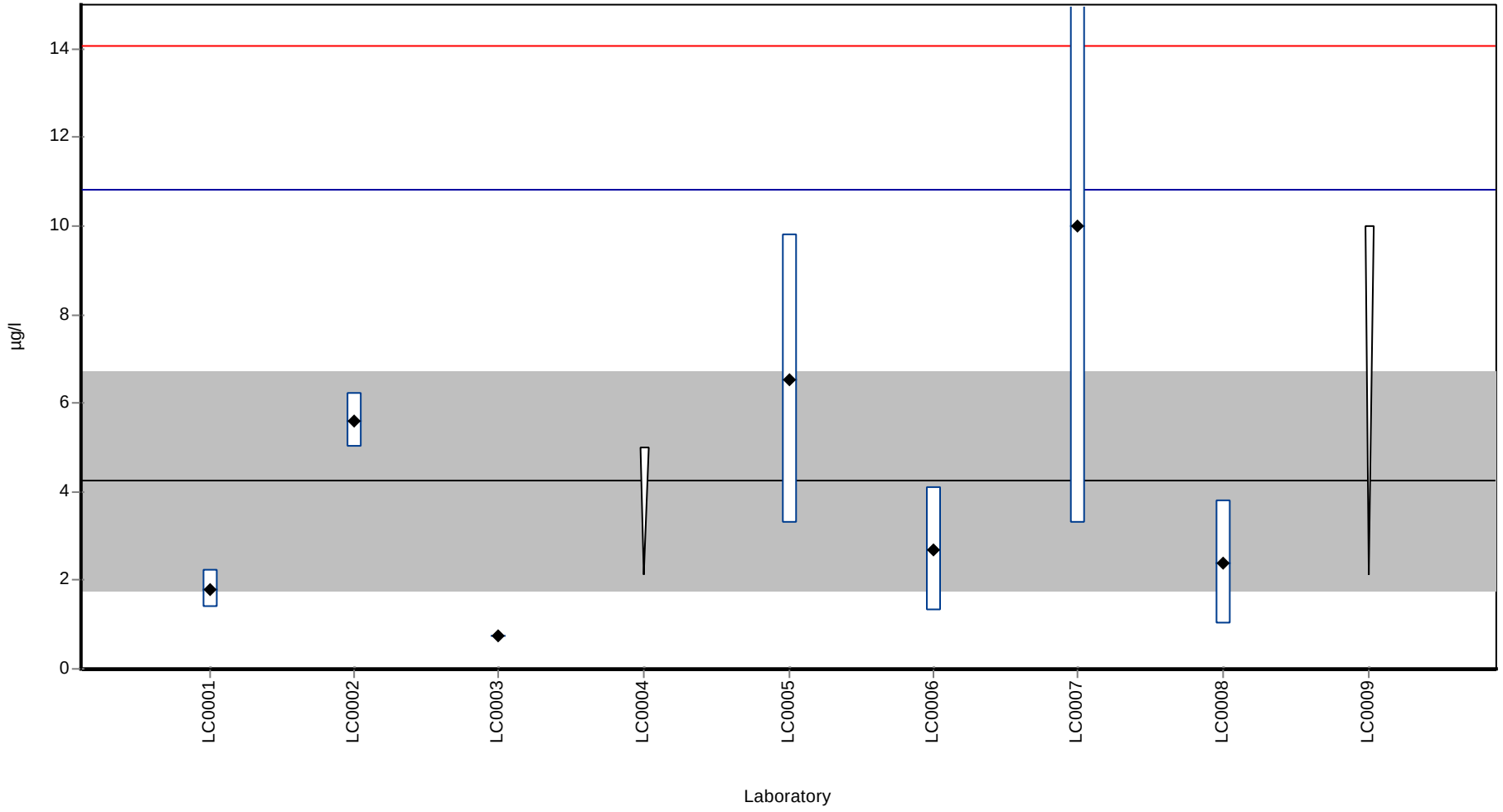
Labcode	Result	± U	Recovery [%]	z-score	Comments
LC0001	1.800	0.430	42.3	-0.7	
LC0002	5.610	0.620	131.9	0.4	
LC0003	0.730	-	17.2	-1.1	
LC0004	<5 (LOD)	-	-	-	
LC0005	6.540	3.270	153.7	0.7	
LC0006	2.700	1.400	63.5	-0.5	
LC0007	10.000	6.700	235.1	1.8	
LC0008	2.400	1.400	56.4	-0.6	
LC0009	< 10 (LOQ)	-	-	-	

Characteristics of parameter

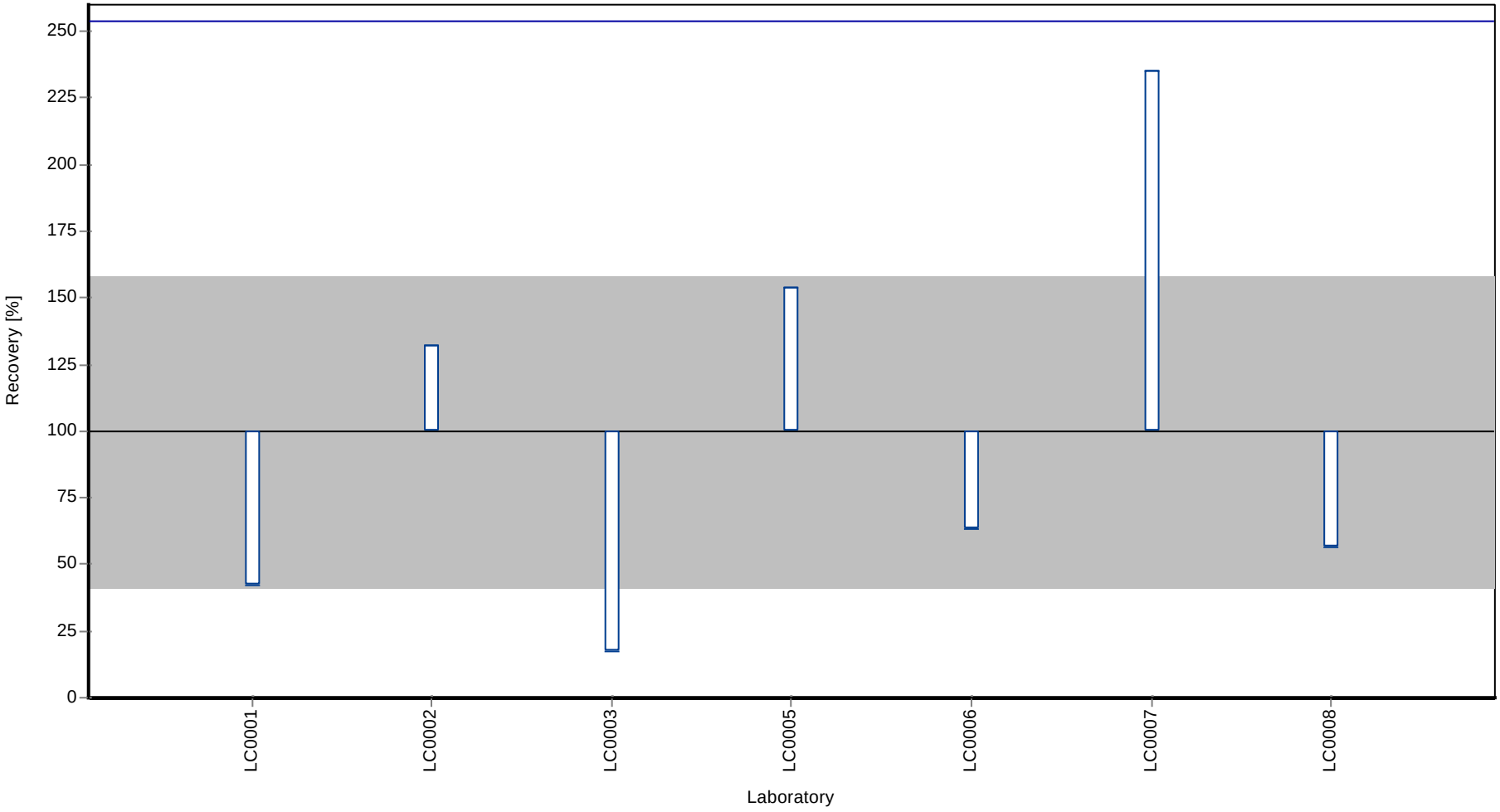
	all results	without outliners	Unit
Mean ± Cl (99%)	4.25 ± 3.71	4.25 ± 3.71	ng/l
Minimum	0.73	0.73	ng/l
Maximum	10	10	ng/l
Standard deviation	3.28	3.28	ng/l
rel. Standard deviation	77	77	%
n	7	7	-

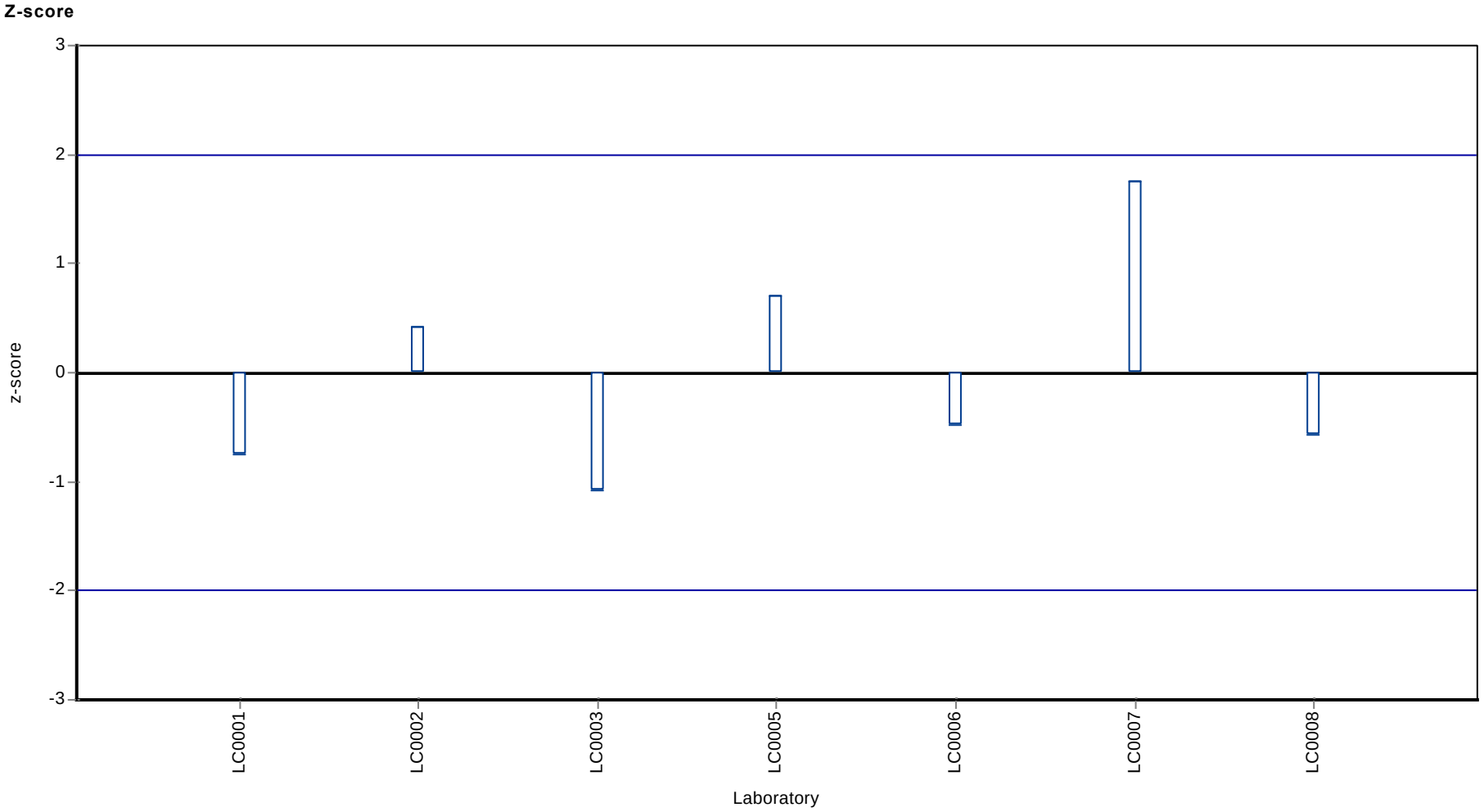
Graphical presentation of results

Results



Recovery rate




Z-score
3
2
1
0
-1
-2
-3
z-score
LC0001
LC0002
LC0003
LC0005
LC0006
LC0007
LC0008
Laboratory

Parameter oriented report

OZ1 A

Tributyltin cation

Unit	ng/l
Mean ± Cl (99%)	-
Minimum - Maximum	0.26 - 0.38
Check value ± U	0.1 (LOD)

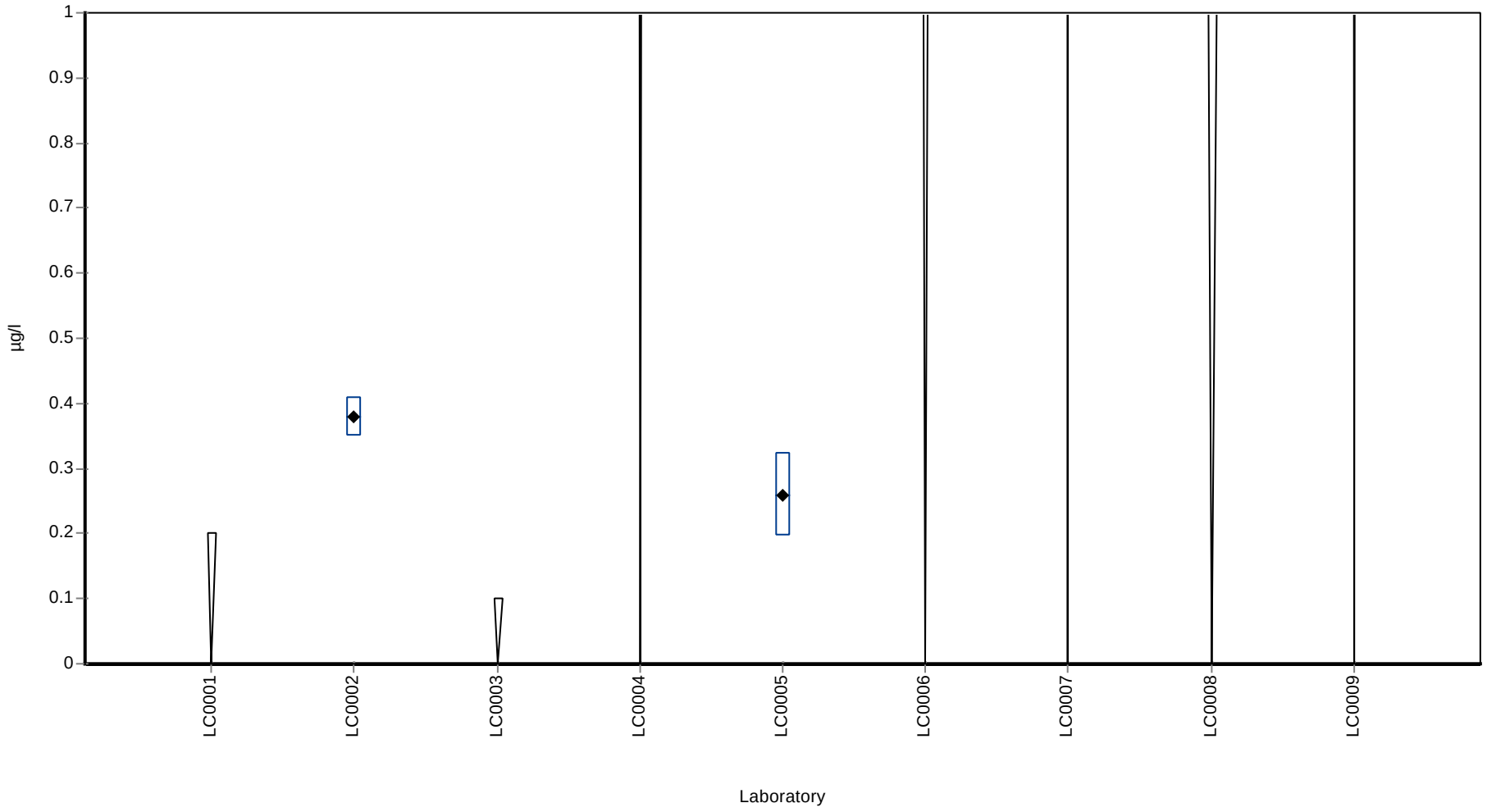
Labcode	Result	± U	Recovery [%]	z-score	Comments
LC0001	< 0.2 (LOQ)	-	-	-	
LC0002	0.380	0.030	-	-	
LC0003	< 0.1 (LOQ)	-	-	-	
LC0004	<5 (LOD)	-	-	-	
LC0005	0.260	0.065	-	-	
LC0006	< 2 (LOQ)	-	-	-	
LC0007	< 100 (LOQ)	-	-	-	
LC0008	<1 (LOD)	-	-	-	
LC0009	< 10 (LOQ)	-	-	-	

Characteristics of parameter

	all results	without outliners	Unit
Mean ± Cl (99%)	0.32 ± 0.18	-	ng/l
Minimum	0.26	0.26	ng/l
Maximum	0.38	0.38	ng/l
Standard deviation	0.0849	-	ng/l
rel. Standard deviation	26.5	-	%
n	2	2	-

Graphical presentation of results

Results



Parameter oriented report

OZ1 B

Tributyltin cation

Unit	ng/l
Mean ± Cl (99%)	-
Minimum - Maximum	0.575 - 5.3
Check value ± U	0.64 ± 0.12

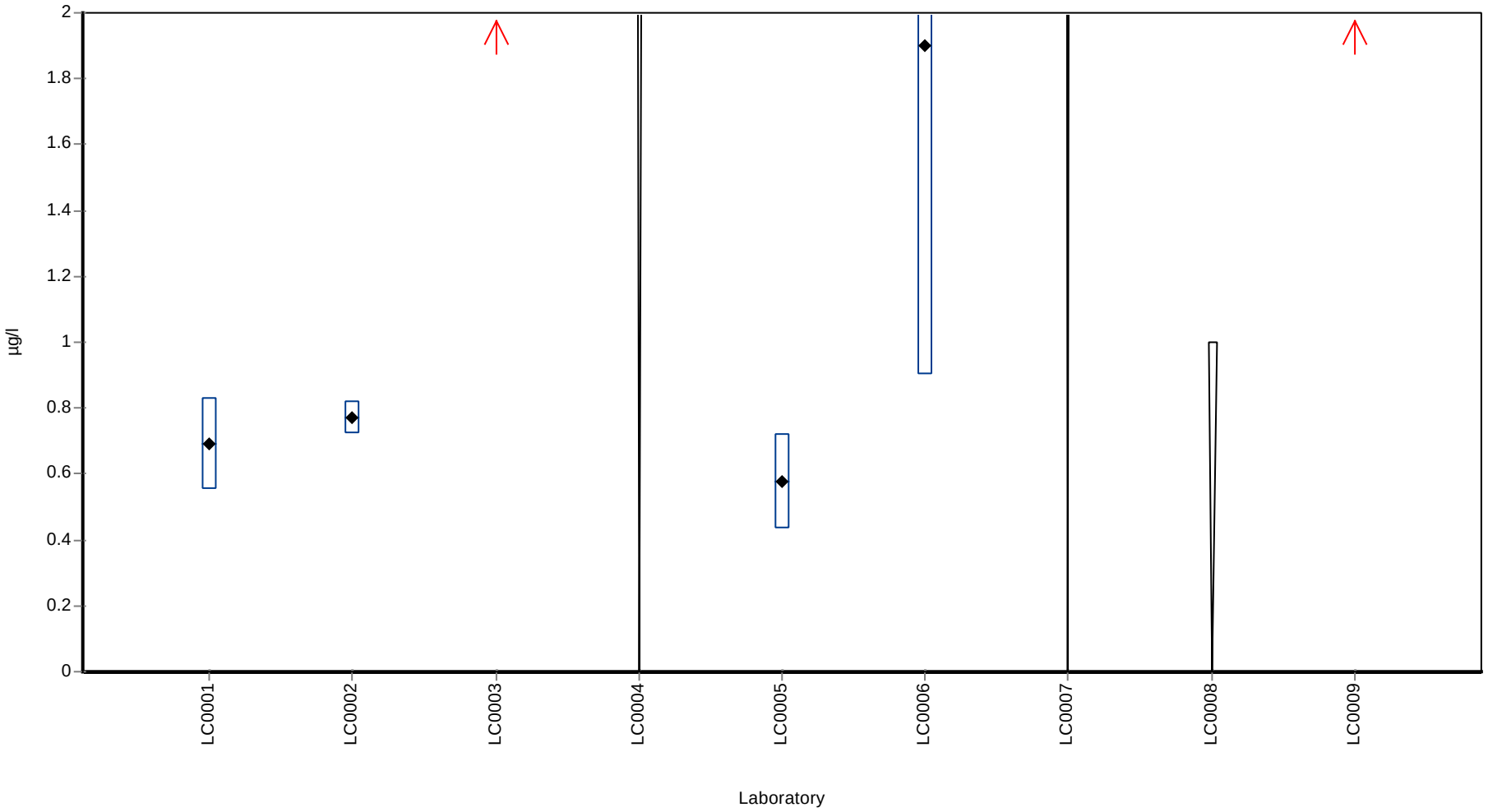
Labcode	Result	± U	Recovery [%]	z-score	Comments
LC0001	0.690	0.140	-	-	
LC0002	0.770	0.050	-	-	
LC0003	5.300	-	-	-	
LC0004	<5 (LOD)	-	-	-	
LC0005	0.575	0.144	-	-	
LC0006	1.900	1.000	-	-	
LC0007	< 10 (LOQ)	-	-	-	
LC0008	<1 (LOD)	-	-	-	
LC0009	48.000	6.000	-	-	FP

Characteristics of parameter

	all results	without outliners	Unit
Mean ± Cl (99%)	9.54 ± 23.2	-	ng/l
Minimum	0.575	0.575	ng/l
Maximum	48	1.9	ng/l
Standard deviation	18.9	-	ng/l
rel. Standard deviation	198	-	%
n	6	5	-

Graphical presentation of results

Results



Parameter oriented report

OZ1 A

Tetrabutyltin cation

Unit	ng/l
Mean ± Cl (99%)	-
Minimum - Maximum	0.16 - 0.16
Check value ± U	< 0.1 (LOD)

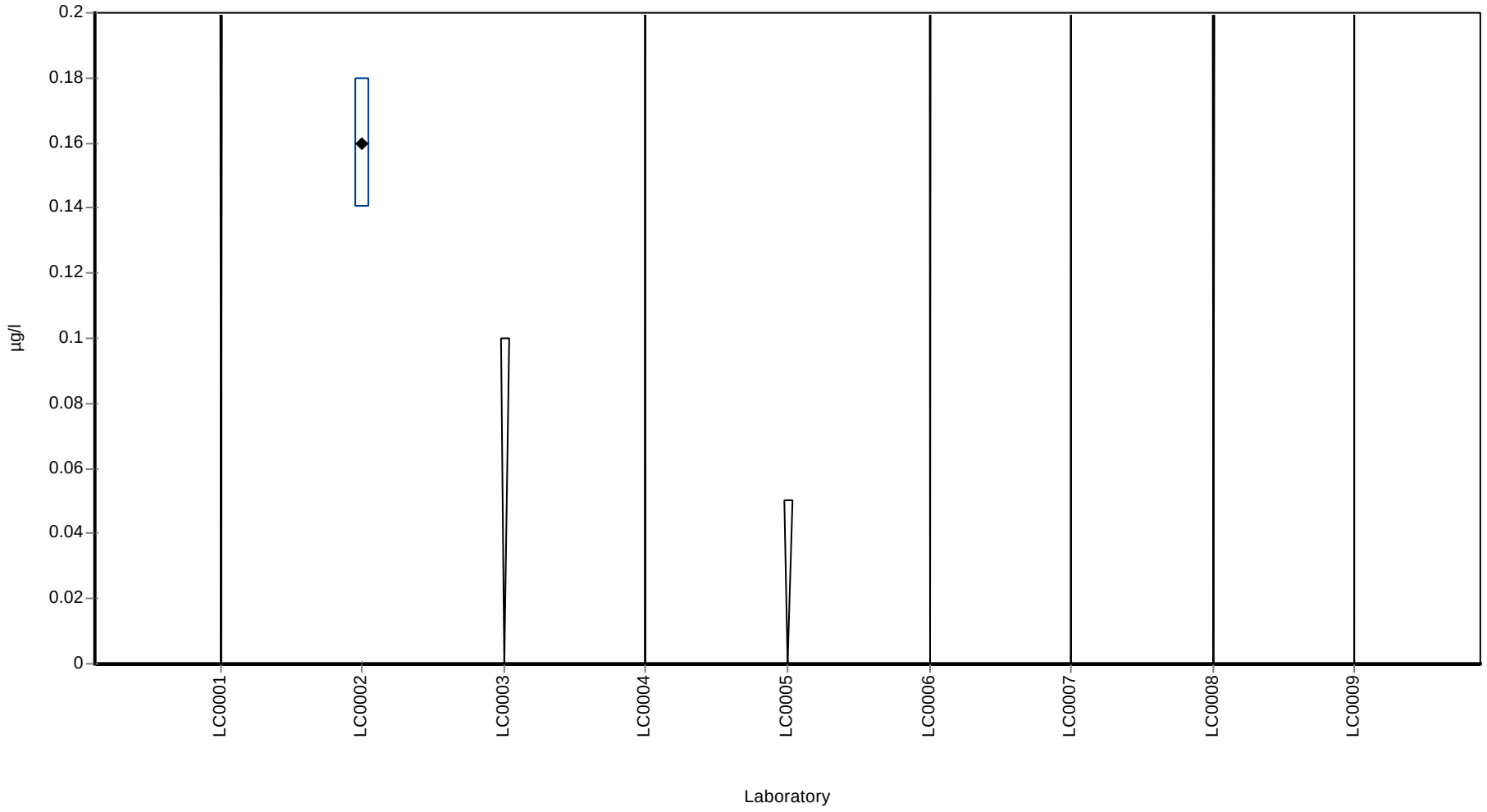
Labcode	Result	± U	Recovery [%]	z-score	Comments
LC0001	< 1 (LOQ)	-	-	-	
LC0002	0.160	0.020	-	-	
LC0003	< 0.1 (LOQ)	-	-	-	
LC0004	<5 (LOD)	-	-	-	
LC0005	< 0.05 (LOQ)	-	-	-	
LC0006	< 2 (LOQ)	-	-	-	
LC0007	< 100 (LOQ)	-	-	-	
LC0008	<1 (LOD)	-	-	-	
LC0009	< 10 (LOQ)	-	-	-	

Characteristics of parameter

	all results	without outliners	Unit
Mean ± Cl (99%)	0.16	-	ng/l
Minimum	0.16	0.16	ng/l
Maximum	0.16	0.16	ng/l
Standard deviation	-	-	ng/l
rel. Standard deviation	-	-	%
n	1	1	-

Graphical presentation of results

Results



Parameter oriented report

OZ1 B

Tetrabutyltin cation

Unit	ng/l
Mean ± Cl (99%)	1.76 ± 0.742
Minimum - Maximum	1.24 - 2.9
Check value ± U	1.6 ± 0.23

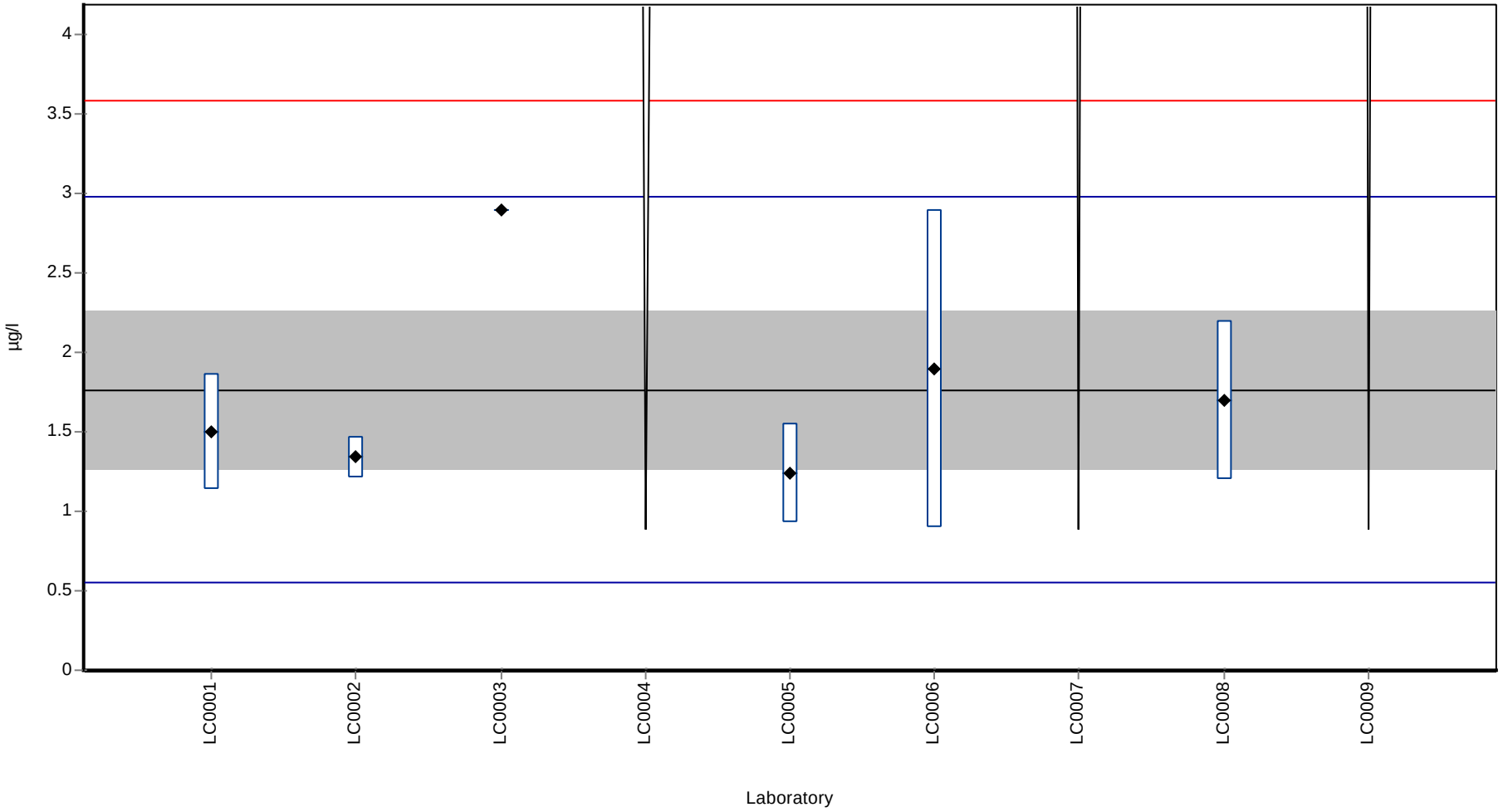
Labcode	Result	± U	Recovery [%]	z-score	Comments
LC0001	1.500	0.360	85.1	-0.4	
LC0002	1.340	0.130	76.0	-0.7	
LC0003	2.900	-	164.5	1.9	
LC0004	<5 (LOD)	-	-	-	
LC0005	1.240	0.310	70.3	-0.9	
LC0006	1.900	1.000	107.8	0.2	
LC0007	< 10 (LOQ)	-	-	-	
LC0008	1.700	0.500	96.4	-0.1	
LC0009	< 10 (LOQ)	-	-	-	

Characteristics of parameter

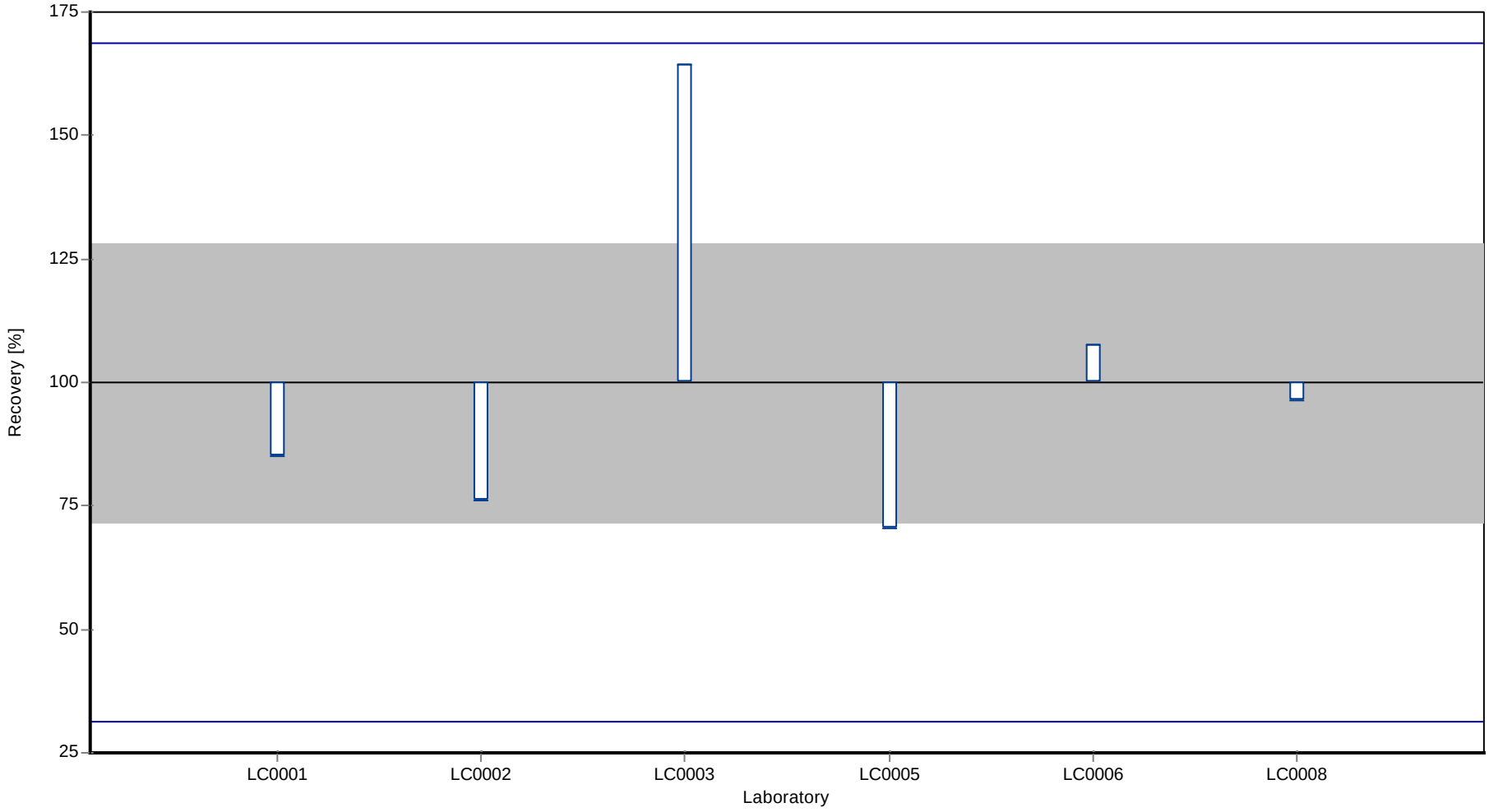
	all results	without outliners	Unit
Mean ± Cl (99%)	1.76 ± 0.742	1.76 ± 0.742	ng/l
Minimum	1.24	1.24	ng/l
Maximum	2.9	2.9	ng/l
Standard deviation	0.606	0.606	ng/l
rel. Standard deviation	34.4	34.4	%
n	6	6	-

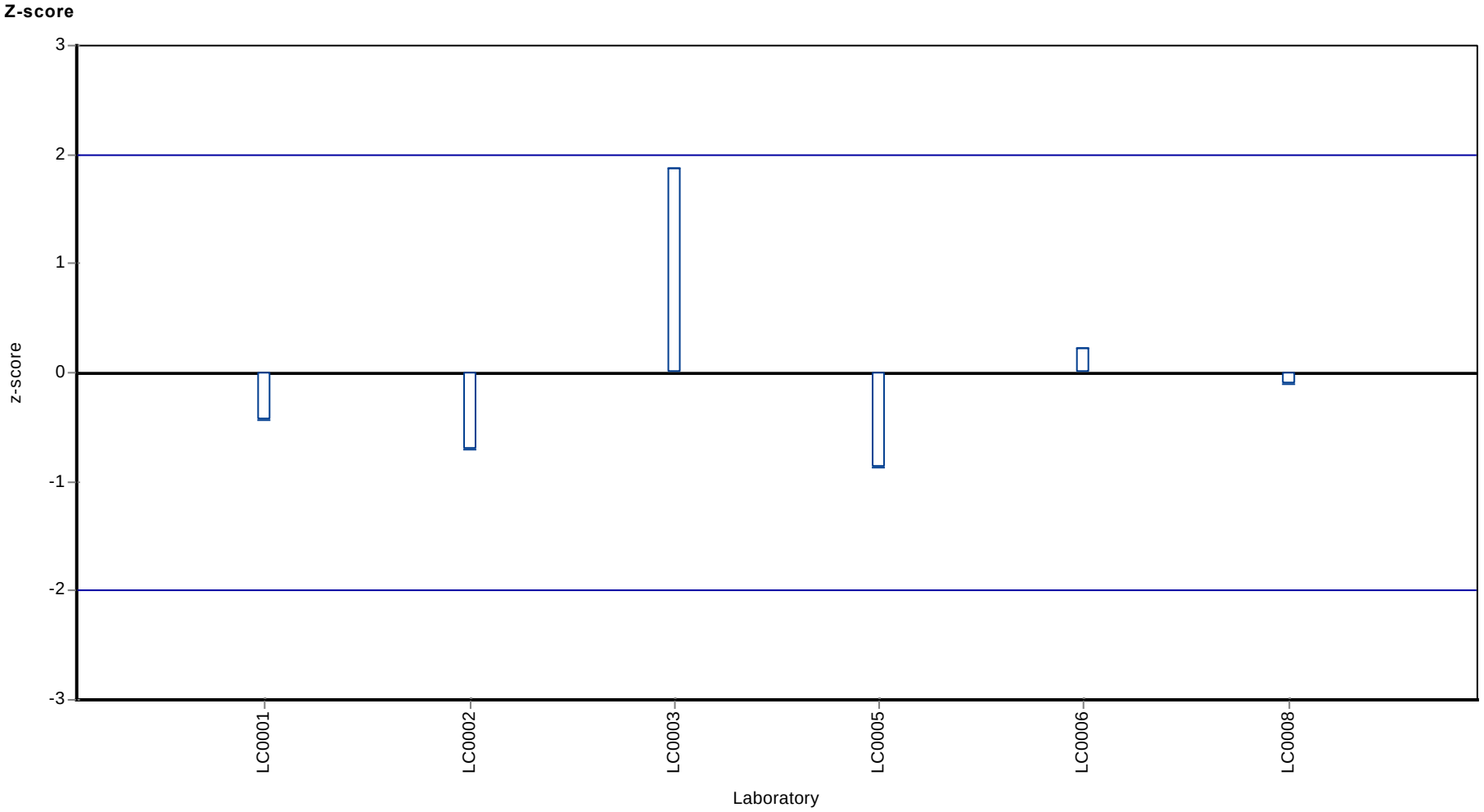
Graphical presentation of results

Results



Recovery rate




Z-score
3
2
1
0
-1
-2
-3
z-score
LC0001
LC0002
LC0003
LC0005
LC0006
LC0008
Laboratory

Parameter oriented report

OZ1 A

Diphenyltin cation

Unit	ng/l
Mean ± Cl (99%)	-
Minimum - Maximum	11 - 874
Check value ± U	21 ± 3.3

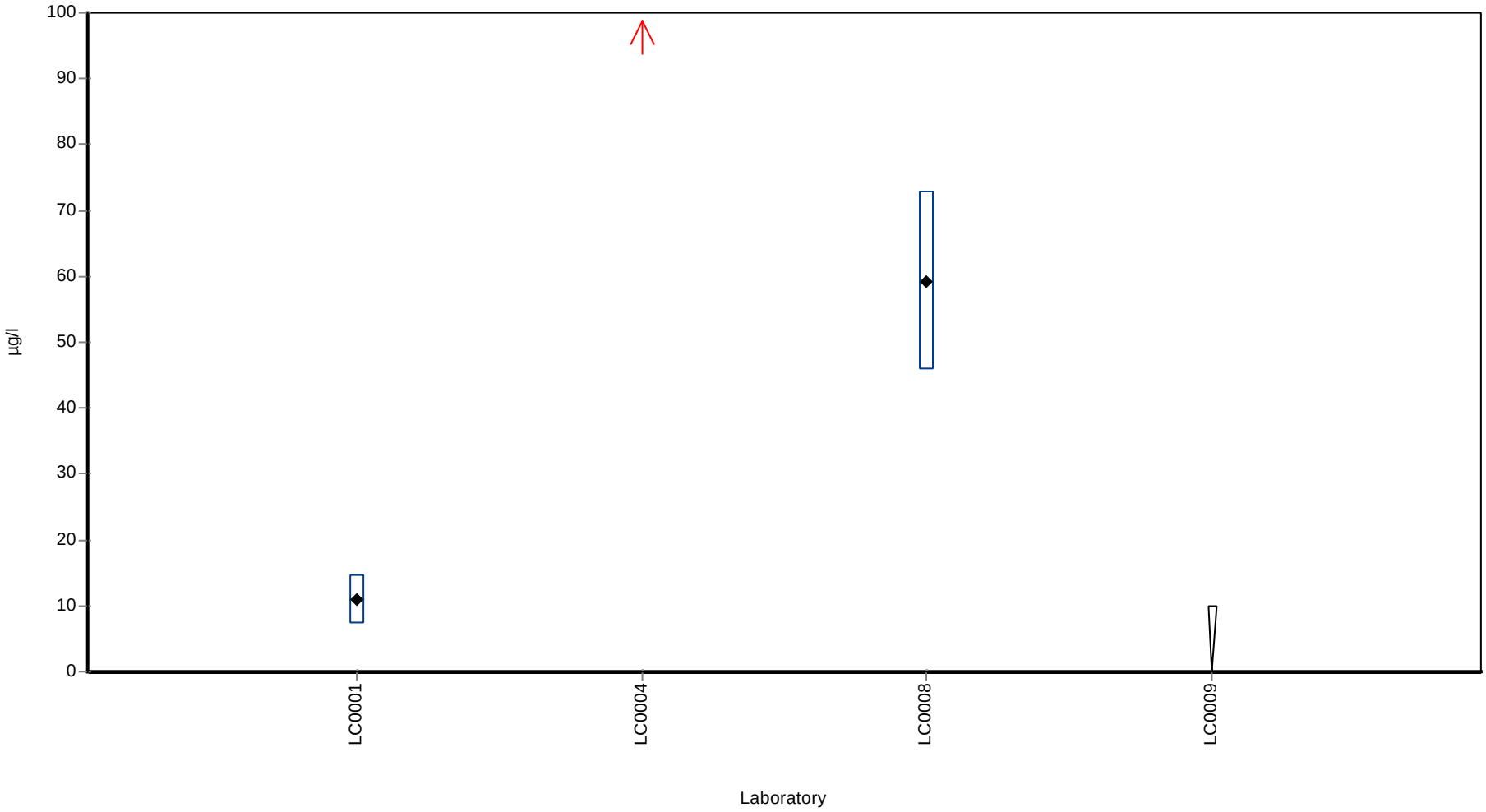
Labcode	Result	± U	Recovery [%]	z-score	Comments
LC0001	11.000	3.700	-	-	
LC0002	-	-	-	-	
LC0003	-	-	-	-	
LC0004	874.000	175.000	-	-	
LC0005	-	-	-	-	
LC0006	-	-	-	-	
LC0007	-	-	-	-	
LC0008	59.300	13.600	-	-	
LC0009	< 10 (LOQ)	-	-	-	

Characteristics of parameter

	all results	without outliners	Unit
Mean ± Cl (99%)	315 ± 840	-	ng/l
Minimum	11	11	ng/l
Maximum	874	874	ng/l
Standard deviation	485	-	ng/l
rel. Standard deviation	154	-	%
n	3	3	-

Graphical presentation of results

Results



Parameter oriented report

OZ1 B

Diphenyltin cation

Unit	ng/l
Mean ± Cl (99%)	-
Minimum - Maximum	-
Check value ± U	< 0.1 (LOD)

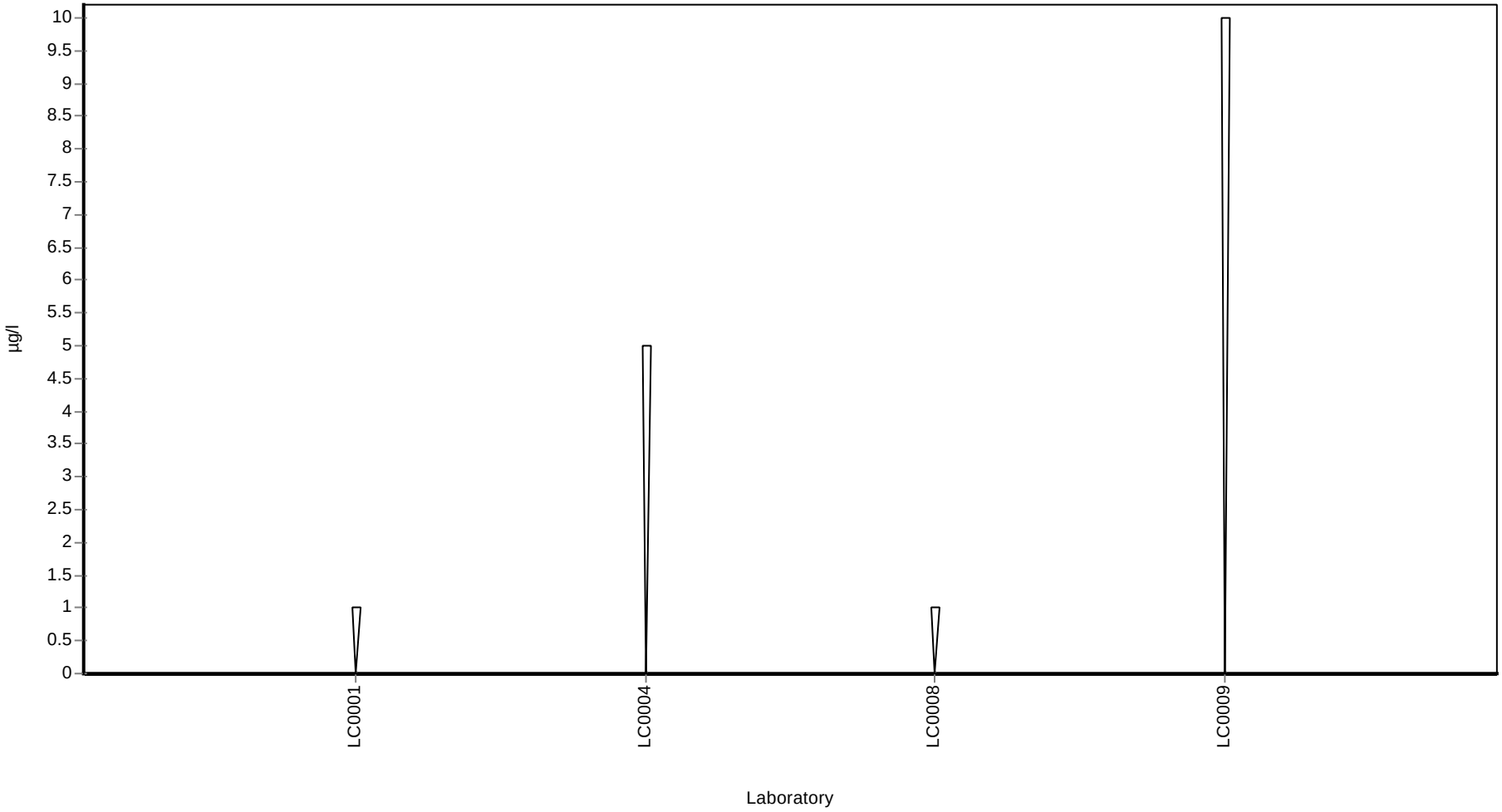
Labcode	Result	± U	Recovery [%]	z-score	Comments
LC0001	< 1 (LOQ)	-	-	-	
LC0002	-	-	-	-	
LC0003	-	-	-	-	
LC0004	<5 (LOD)	-	-	-	
LC0005	-	-	-	-	
LC0006	-	-	-	-	
LC0007	-	-	-	-	
LC0008	<1 (LOD)	-	-	-	
LC0009	< 10 (LOQ)	-	-	-	

Characteristics of parameter

	all results	without outliners	Unit
Mean ± Cl (99%)	-	-	ng/l
Minimum	-	-	ng/l
Maximum	-	-	ng/l
Standard deviation	-	-	ng/l
rel. Standard deviation	-	-	%
n	-	-	-

Graphical presentation of results

Results



Parameter oriented report

OZ1 A

Triphenyltin cation

Unit	ng/l
Mean ± Cl (99%)	21.3 ± 12.3
Minimum - Maximum	7.7 - 38
Check value ± U	13 ± 1.9

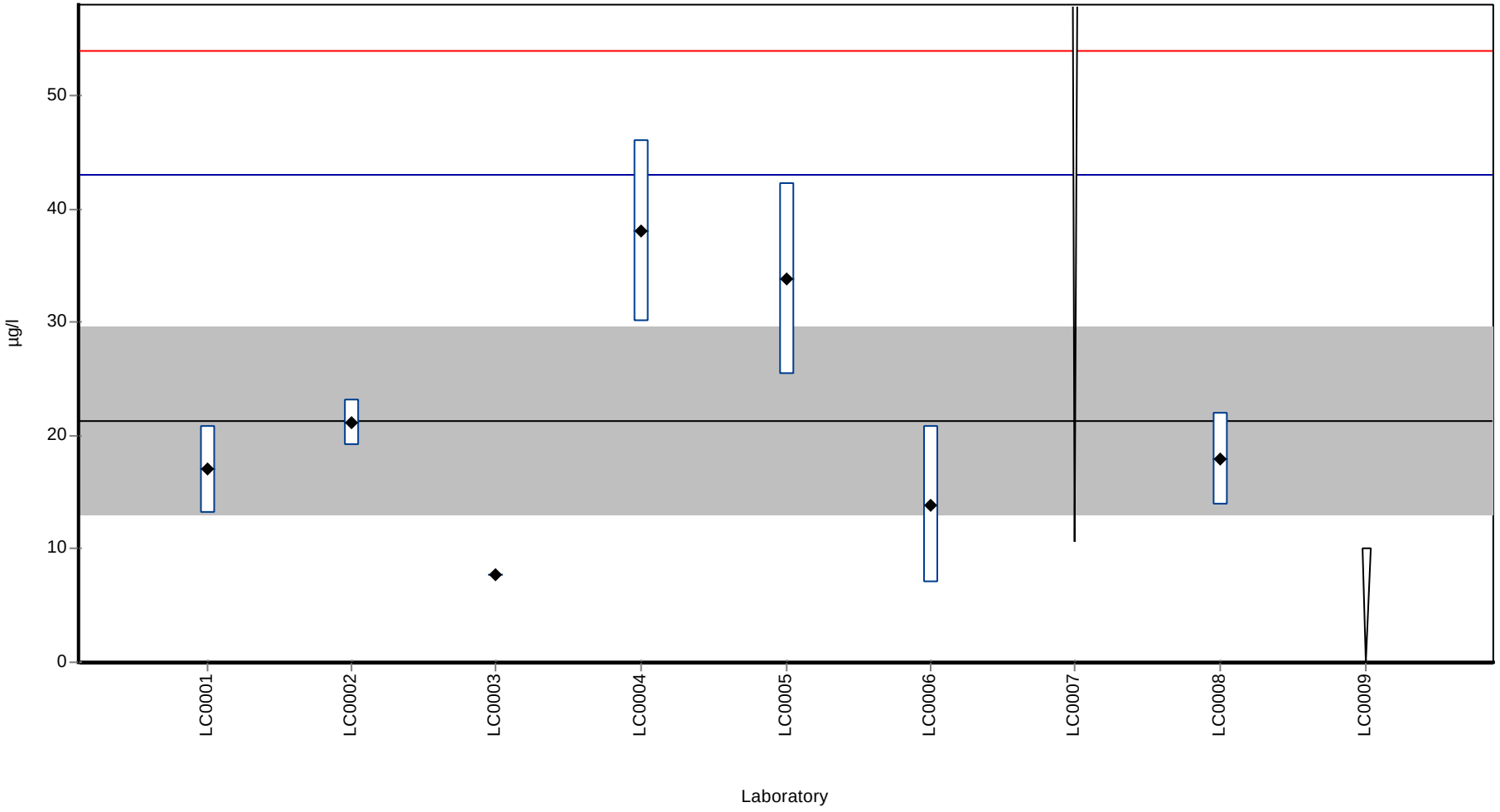
Labcode	Result	± U	Recovery [%]	z-score	Comments
LC0001	17.000	3.900	79.7	-0.4	
LC0002	21.100	2.000	98.9	0.0	
LC0003	7.700	-	36.1	-1.3	
LC0004	38.000	8.000	178.0	1.5	
LC0005	33.800	8.450	158.4	1.1	
LC0006	13.900	6.900	65.1	-0.7	
LC0007	< 100 (LOQ)	-	-	-	
LC0008	17.900	4.100	83.9	-0.3	
LC0009	< 10 (LOQ)	-	-	-	

Characteristics of parameter

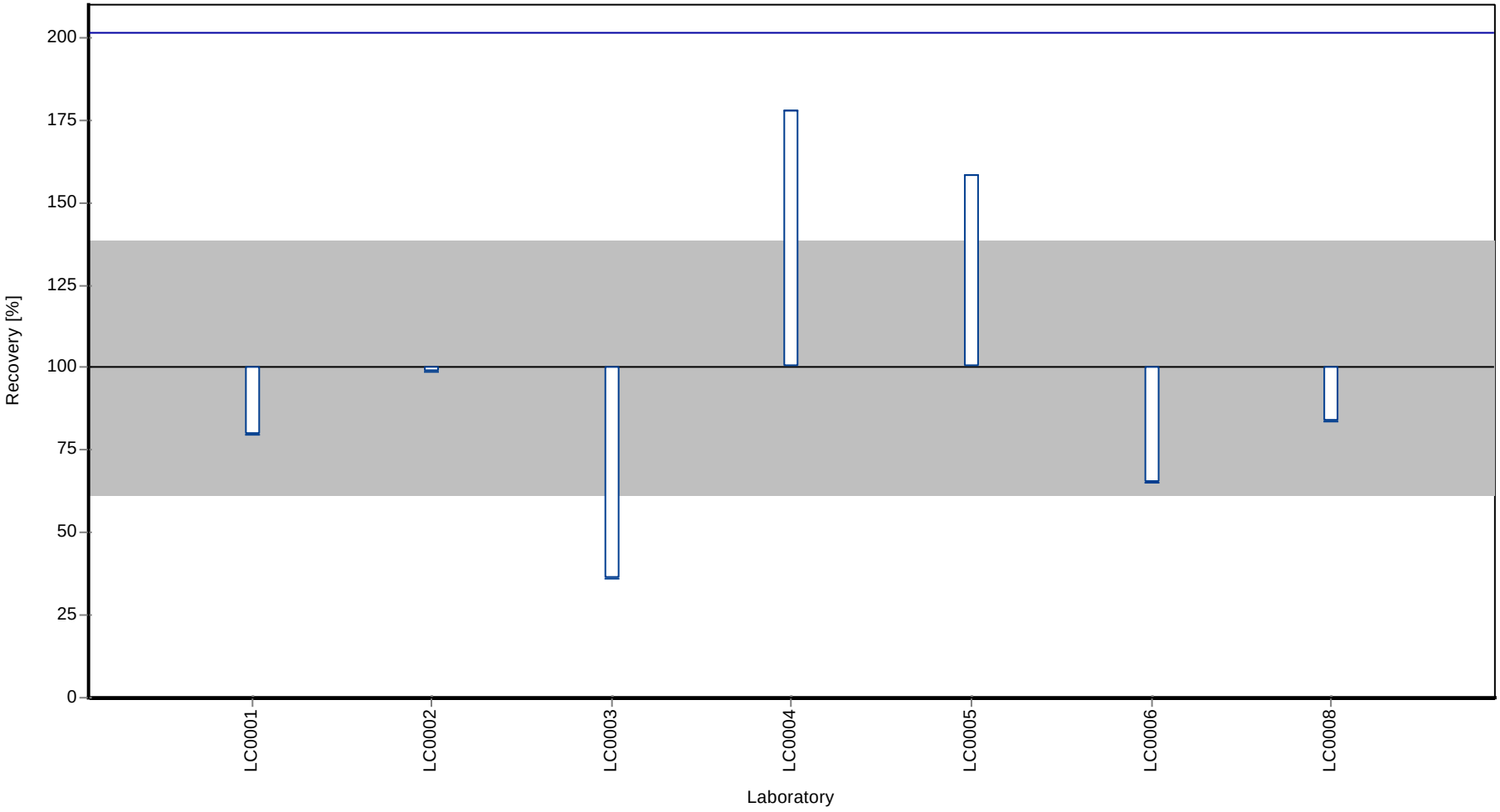
	all results	without outliners	Unit
Mean ± Cl (99%)	21.3 ± 12.3	21.3 ± 12.3	ng/l
Minimum	7.7	7.7	ng/l
Maximum	38	38	ng/l
Standard deviation	10.8	10.8	ng/l
rel. Standard deviation	50.8	50.8	%
n	7	7	-

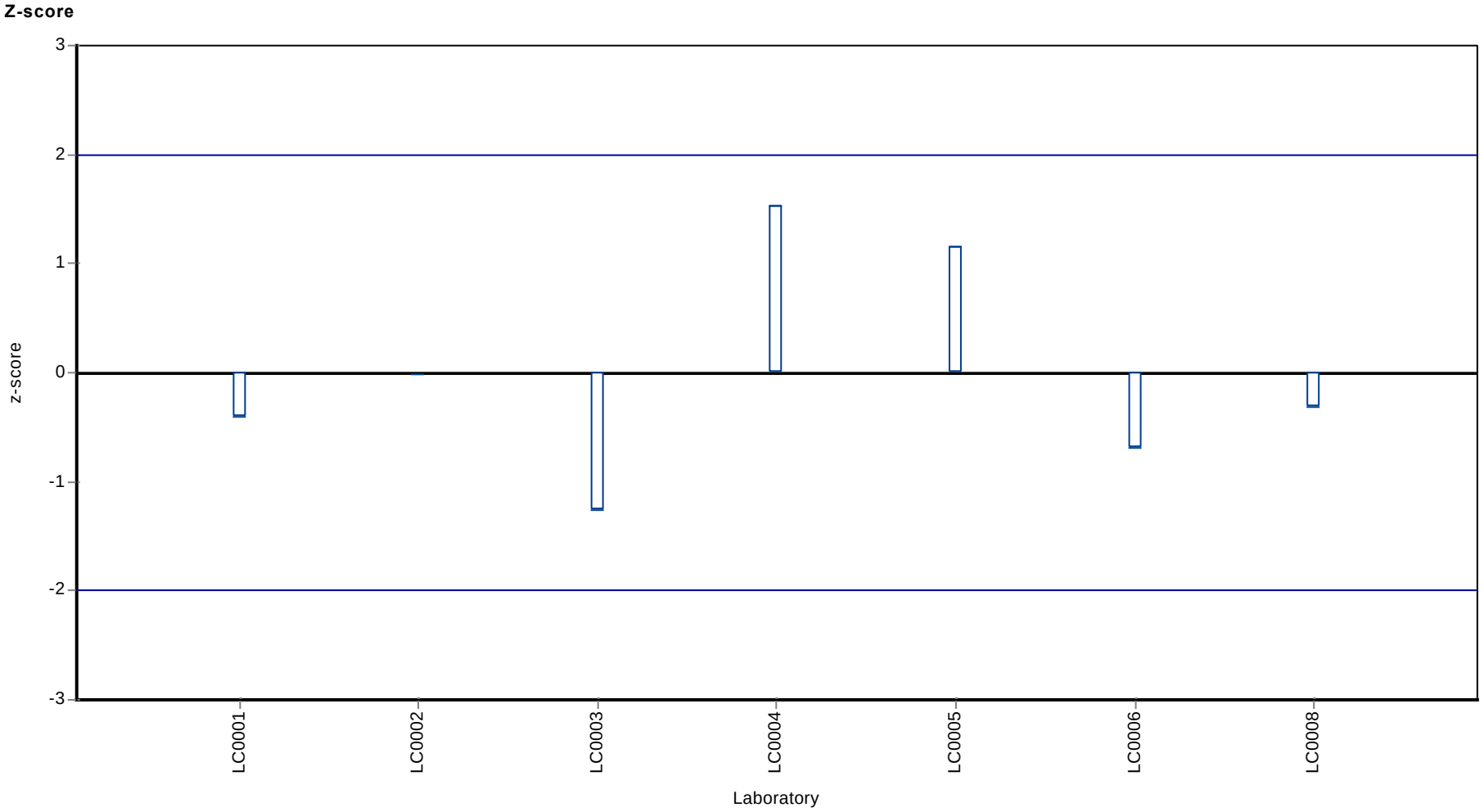
Graphical presentation of results

Results



Recovery rate




Z-score
3
2
1
0
-1
-2
-3
z-score
LC0001
LC0002
LC0003
LC0004
LC0005
LC0006
LC0008
Laboratory

Parameter oriented report

OZ1 B

Triphenyltin cation

Unit	ng/l
Mean ± Cl (99%)	2.43 ± 1.23
Minimum - Maximum	0.75 - 3.8
Check value ± U	2.4 ± 0.22

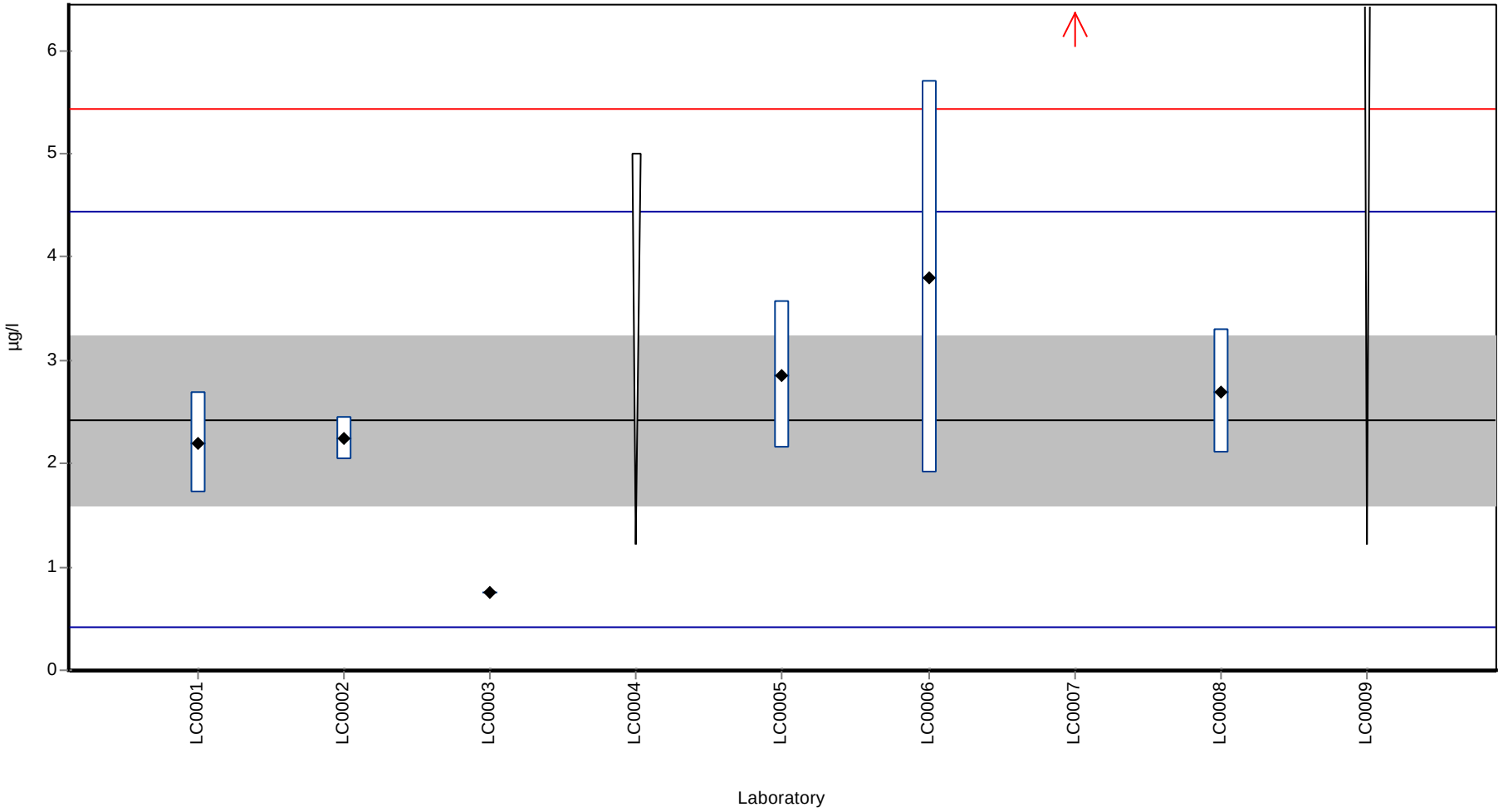
Labcode	Result	± U	Recovery [%]	z-score	Comments
LC0001	2.200	0.490	90.7	-0.2	
LC0002	2.240	0.210	92.4	-0.2	
LC0003	0.750	-	30.9	-1.7	
LC0004	<5 (LOD)	-	-	-	
LC0005	2.860	0.715	117.9	0.4	
LC0006	3.800	1.900	156.7	1.4	
LC0007	18.000	8.800	742.3	15.5	H
LC0008	2.700	0.600	111.3	0.3	
LC0009	< 10 (LOQ)	-	-	-	

Characteristics of parameter

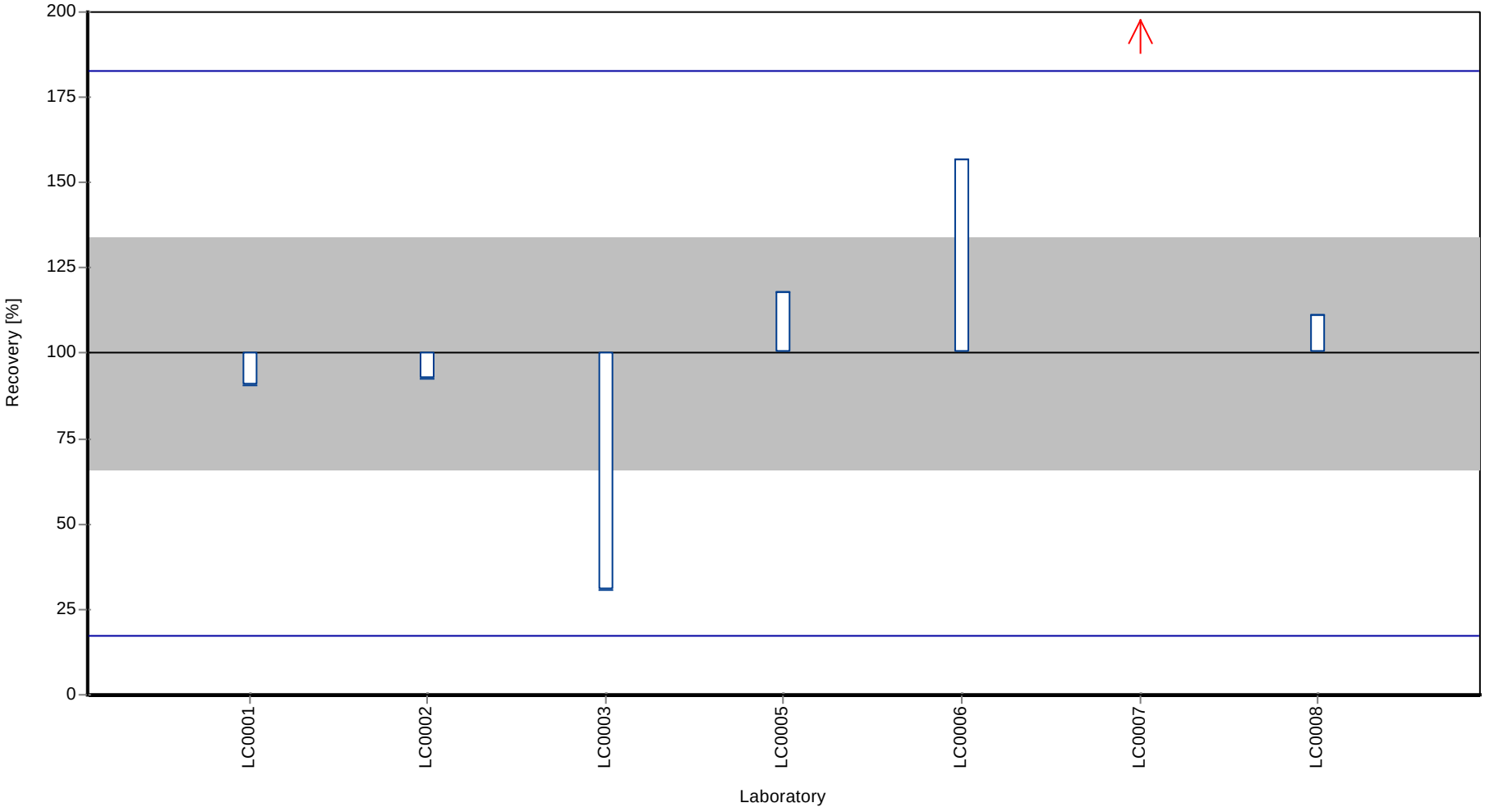
	all results	without outliners	Unit
Mean ± Cl (99%)	4.65 ± 6.76	2.43 ± 1.23	ng/l
Minimum	0.75	0.75	ng/l
Maximum	18	3.8	ng/l
Standard deviation	5.96	1	ng/l
rel. Standard deviation	128	41.4	%
n	7	6	-

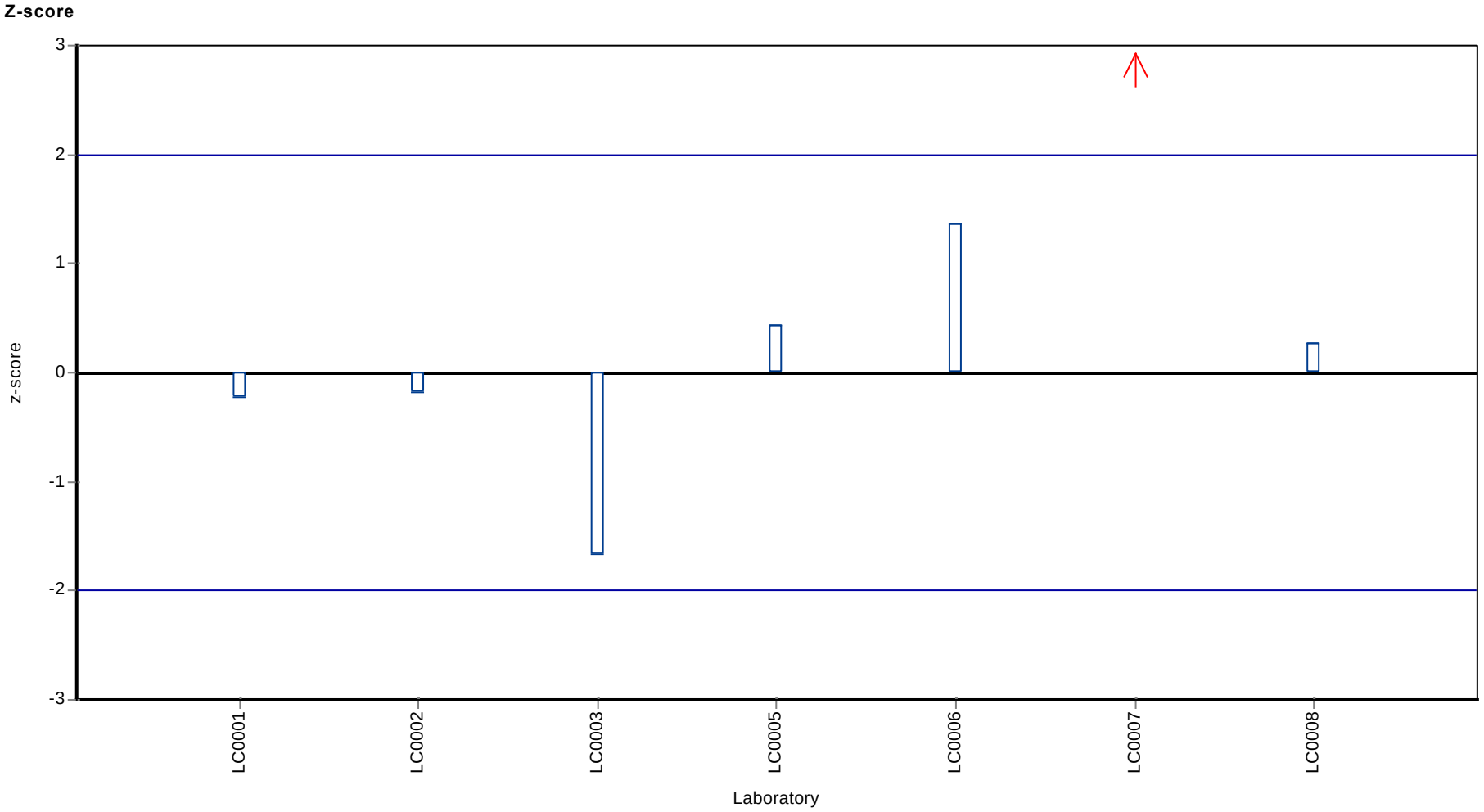
Graphical presentation of results

Results



Recovery rate




Z-score
3
2
1
0
-1
-2
-3
z-score
LC0001
LC0002
LC0003
LC0005
LC0006
LC0007
LC0008
Laboratory

8 Laboratory oriented report

The laboratory oriented report is sorted by laboratory code.

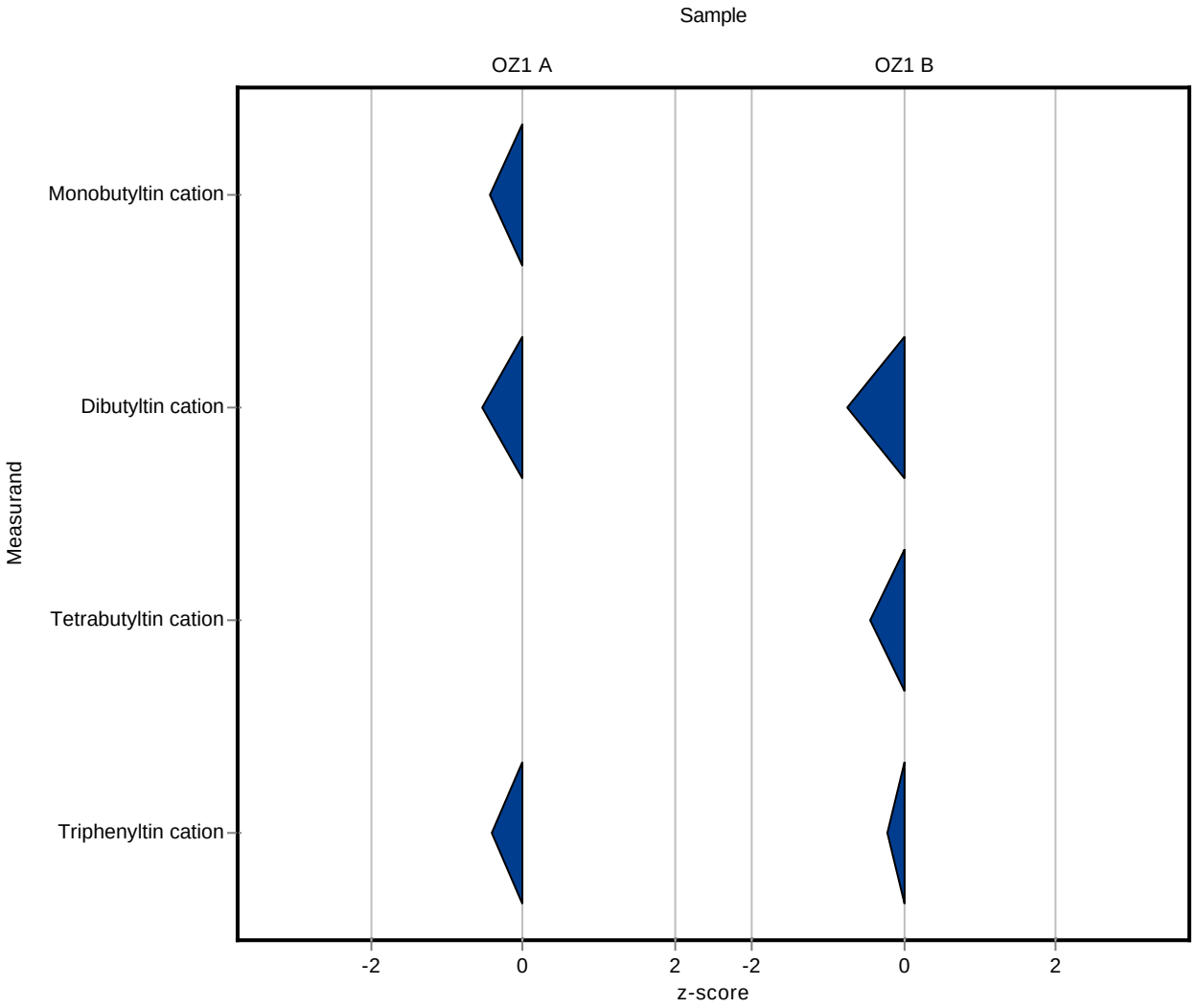
The following results were achieved:

Sample: OZ1A

Parameter	Unit	Target	±	CI(99%)	Result	± U	Criteria	Recovery	z-score
Monobutyltin cation	ng/l	36.3	±	24.4	26	12	23	71.7	-0.45
Dibutyltin cation	ng/l	17.6	±	9.38	13	3	8.85	73.7	-0.52
Tributyltin cation	ng/l	-	±	-	<0.2 (LOQ)	-	-	-	-
Tetrabutyltin cation	ng/l	-	±	-	<1 (LOQ)	-	-	-	-
Diphenyltin cation	ng/l	-	±	-	11	3.7	-	-	-
Triphenyltin cation	ng/l	21.3	±	12.3	17	3.9	10.8	79.7	-0.40

Sample: OZ1B

Parameter	Unit	Target	±	CI(99%)	Result	± U	Criteria	Recovery	z-score
Monobutyltin cation	ng/l	-	±	-	-	-	-	-	-
Dibutyltin cation	ng/l	4.25	±	3.71	1.8	0.43	3.28	42.3	-0.75
Tributyltin cation	ng/l	-	±	-	0.69	0.14	-	-	-
Tetrabutyltin cation	ng/l	1.76	±	0.742	1.5	0.36	0.606	85.1	-0.43
Diphenyltin cation	ng/l	-	±	-	<1 (LOQ)	-	-	-	-
Triphenyltin cation	ng/l	2.43	±	1.23	2.2	0.49	1	90.7	-0.22


Sample
OZ1 A
OZ1 B
Monobutyltin cation
Dibutyltin cation
Tetrabutyltin cation
Triphenyltin cation
Measurand
-2
0
2
-2
0
2
z-score

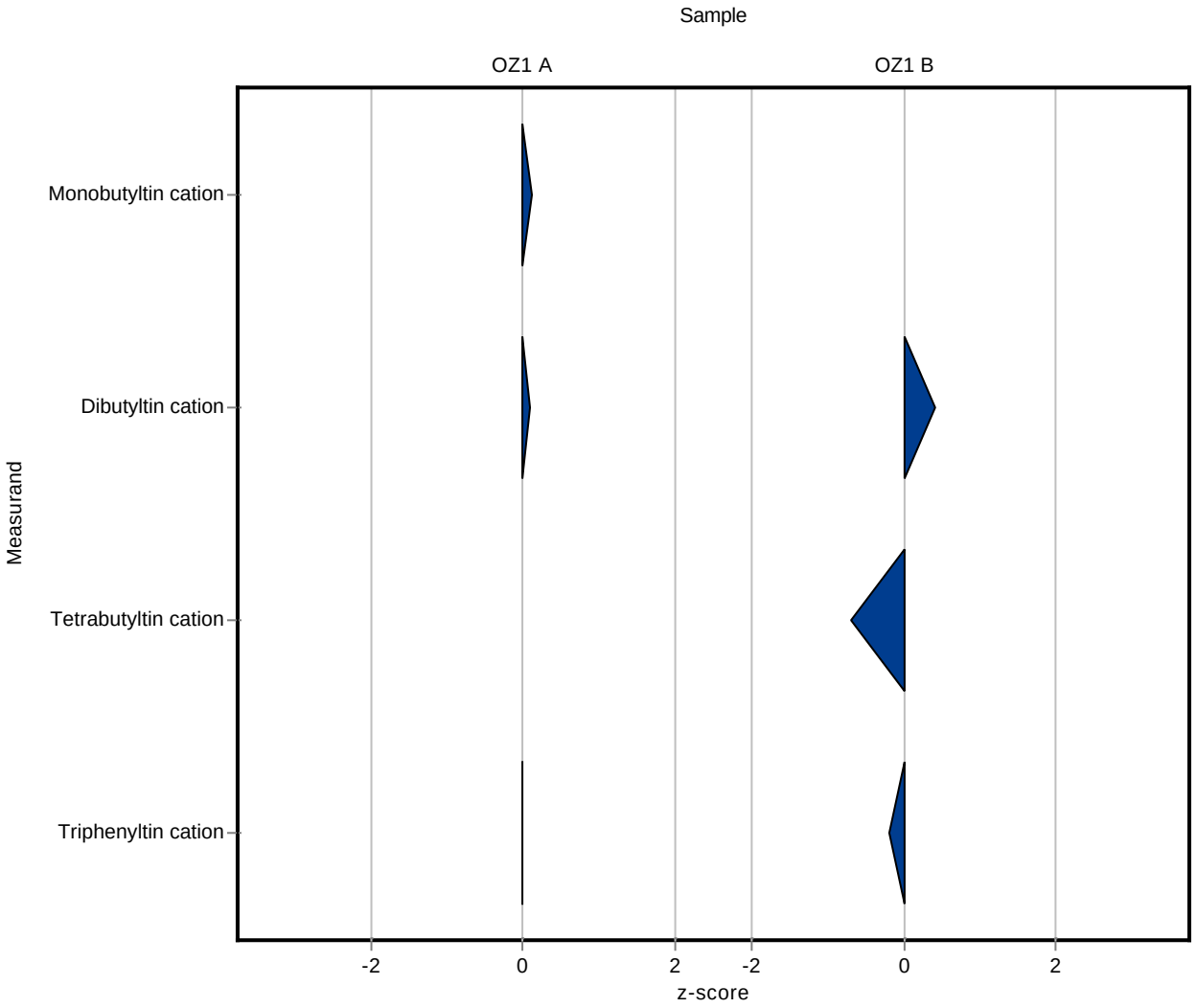
The following results were achieved:

Sample: OZ1A

Parameter	Unit	Target	±	CI(99%)	Result	± U	Criteria	Recovery	z-score
Monobutyltin cation	ng/l	36.3	±	24.4	38.9	4.1	23	107.2	0.11
Dibutyltin cation	ng/l	17.6	±	9.38	18.4	2	8.85	104.3	0.09
Tributyltin cation	ng/l	-	±	-	0.38	0.03	-	-	-
Tetrabutyltin cation	ng/l	-	±	-	0.16	0.02	-	-	-
Diphenyltin cation	ng/l	-	±	-	-	-	-	-	-
Triphenyltin cation	ng/l	21.3	±	12.3	21.1	2	10.8	98.9	-0.02

Sample: OZ1B

Parameter	Unit	Target	±	CI(99%)	Result	± U	Criteria	Recovery	z-score
Monobutyltin cation	ng/l	-	±	-	1.01	0.11	-	-	-
Dibutyltin cation	ng/l	4.25	±	3.71	5.61	0.62	3.28	131.9	0.41
Tributyltin cation	ng/l	-	±	-	0.77	0.05	-	-	-
Tetrabutyltin cation	ng/l	1.76	±	0.742	1.34	0.13	0.606	76.0	-0.70
Diphenyltin cation	ng/l	-	±	-	-	-	-	-	-
Triphenyltin cation	ng/l	2.43	±	1.23	2.24	0.21	1	92.4	-0.18


Sample
OZ1 A
OZ1 B
Monobutyltin cation
Dibutyltin cation
Tetrabutyltin cation
Triphenyltin cation
Measurand
-2
0
2
-2
0
2
z-score

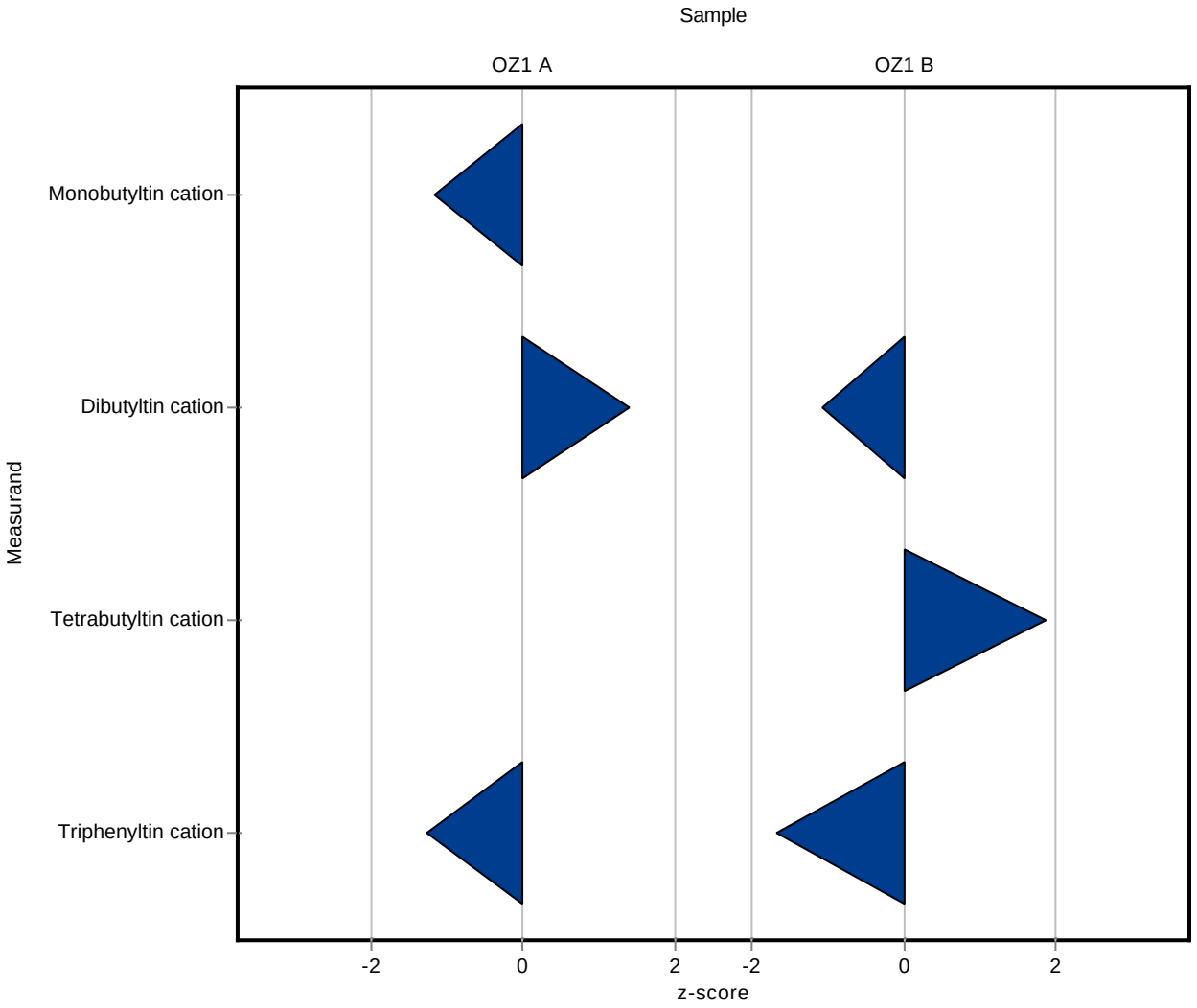
The following results were achieved:

Sample: OZ1A

Parameter	Unit	Target	±	CI(99%)	Result	± U	Criteria	Recovery	z-score
Monobutyltin cation	ng/l	36.3	±	24.4	9.4	-	23	25.9	-1.17
Dibutyltin cation	ng/l	17.6	±	9.38	30	-	8.85	170.1	1.40
Tributyltin cation	ng/l	-	±	-	<0.1 (LOQ)	-	-	-	-
Tetrabutyltin cation	ng/l	-	±	-	<0.1 (LOQ)	-	-	-	-
Diphenyltin cation	ng/l	-	±	-	-	-	-	-	-
Triphenyltin cation	ng/l	21.3	±	12.3	7.7	-	10.8	36.1	-1.26

Sample: OZ1B

Parameter	Unit	Target	±	CI(99%)	Result	± U	Criteria	Recovery	z-score
Monobutyltin cation	ng/l	-	±	-	<0.1 (LOQ)	-	-	-	-
Dibutyltin cation	ng/l	4.25	±	3.71	0.73	-	3.28	17.2	-1.08
Tributyltin cation	ng/l	-	±	-	5.3	-	-	-	-
Tetrabutyltin cation	ng/l	1.76	±	0.742	2.9	-	0.606	164.5	1.88
Diphenyltin cation	ng/l	-	±	-	-	-	-	-	-
Triphenyltin cation	ng/l	2.43	±	1.23	0.75	-	1	30.9	-1.67


Sample
OZ1 A
OZ1 B
Monobutyltin cation
Dibutyltin cation
Tetrabutyltin cation
Triphenyltin cation
Measurand
-2
0
2
-2
0
2
z-score

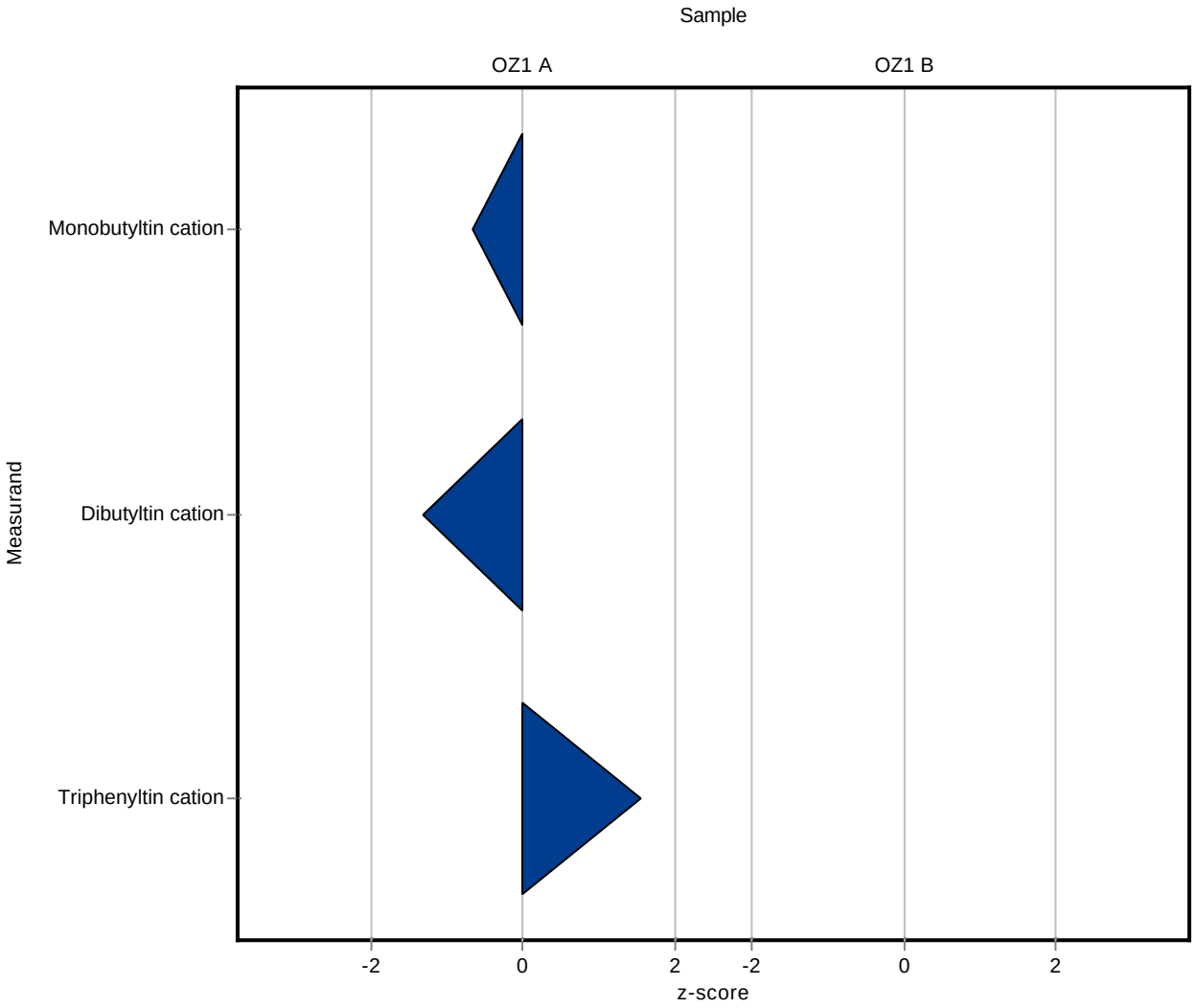
The following results were achieved:

Sample: OZ1A

Parameter	Unit	Target	±	CI(99%)	Result	± U	Criteria	Recovery	z-score
Monobutyltin cation	ng/l	36.3	±	24.4	21	4	23	57.9	-0.66
Dibutyltin cation	ng/l	17.6	±	9.38	6	1	8.85	34.0	-1.32
Tributyltin cation	ng/l	-	±	-	<5 (LOD)	-	-	-	-
Tetrabutyltin cation	ng/l	-	±	-	<5 (LOD)	-	-	-	-
Diphenyltin cation	ng/l	-	±	-	874	175	-	-	-
Triphenyltin cation	ng/l	21.3	±	12.3	38	8	10.8	178.0	1.54

Sample: OZ1B

Parameter	Unit	Target	±	CI(99%)	Result	± U	Criteria	Recovery	z-score
Monobutyltin cation	ng/l	-	±	-	<5 (LOD)	-	-	-	-
Dibutyltin cation	ng/l	4.25	±	3.71	<5 (LOD)	-	3.28	-	-
Tributyltin cation	ng/l	-	±	-	<5 (LOD)	-	-	-	-
Tetrabutyltin cation	ng/l	1.76	±	0.742	<5 (LOD)	-	0.606	-	-
Diphenyltin cation	ng/l	-	±	-	<5 (LOD)	-	-	-	-
Triphenyltin cation	ng/l	2.43	±	1.23	<5 (LOD)	-	1	-	-


Sample
OZ1 A
OZ1 B
Monobutyltin cation
Dibutyltin cation
Triphenyltin cation
Measurand
-2
0
2
-2
0
2
z-score

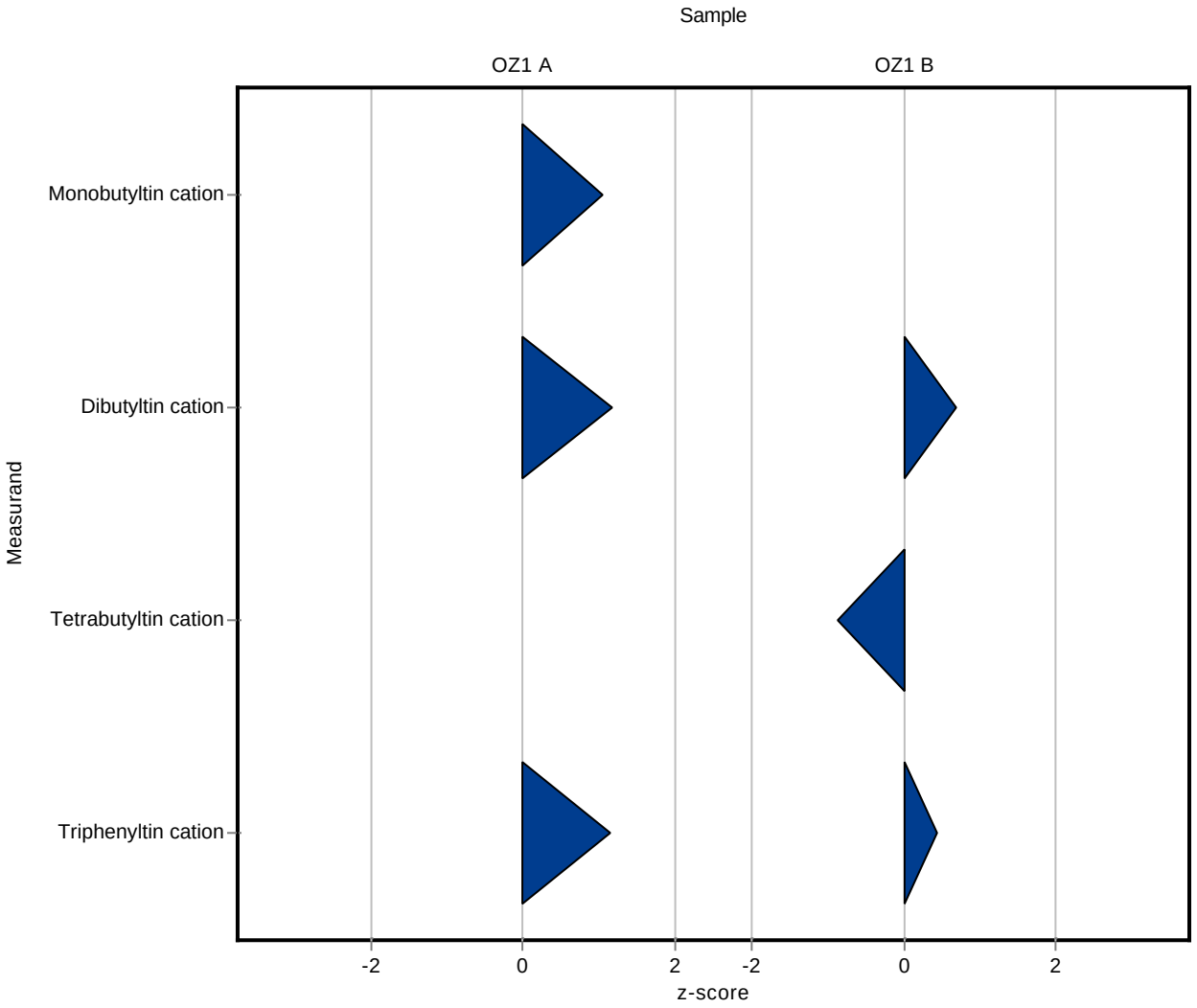
The following results were achieved:

Sample: OZ1A

Parameter	Unit	Target	±	CI(99%)	Result	± U	Criteria	Recovery	z-score
Monobutyltin cation	ng/l	36.3	±	24.4	60.23	30.12	23	166.0	1.04
Dibutyltin cation	ng/l	17.6	±	9.38	28.03	14.015	8.85	158.9	1.17
Tributyltin cation	ng/l	-	±	-	0.26	0.065	-	-	-
Tetrabutyltin cation	ng/l	-	±	-	<0.05 (LOQ)	-	-	-	-
Diphenyltin cation	ng/l	-	±	-	-	-	-	-	-
Triphenyltin cation	ng/l	21.3	±	12.3	33.8	8.45	10.8	158.4	1.15

Sample: OZ1B

Parameter	Unit	Target	±	CI(99%)	Result	± U	Criteria	Recovery	z-score
Monobutyltin cation	ng/l	-	±	-	3.12	1.56	-	-	-
Dibutyltin cation	ng/l	4.25	±	3.71	6.54	3.27	3.28	153.7	0.70
Tributyltin cation	ng/l	-	±	-	0.575	0.144	-	-	-
Tetrabutyltin cation	ng/l	1.76	±	0.742	1.24	0.31	0.606	70.3	-0.86
Diphenyltin cation	ng/l	-	±	-	-	-	-	-	-
Triphenyltin cation	ng/l	2.43	±	1.23	2.86	0.715	1	117.9	0.43


Sample
OZ1 A
OZ1 B
Monobutyltin cation
Dibutyltin cation
Tetrabutyltin cation
Triphenyltin cation
Measurand
-2
0
2
-2
0
2
z-score

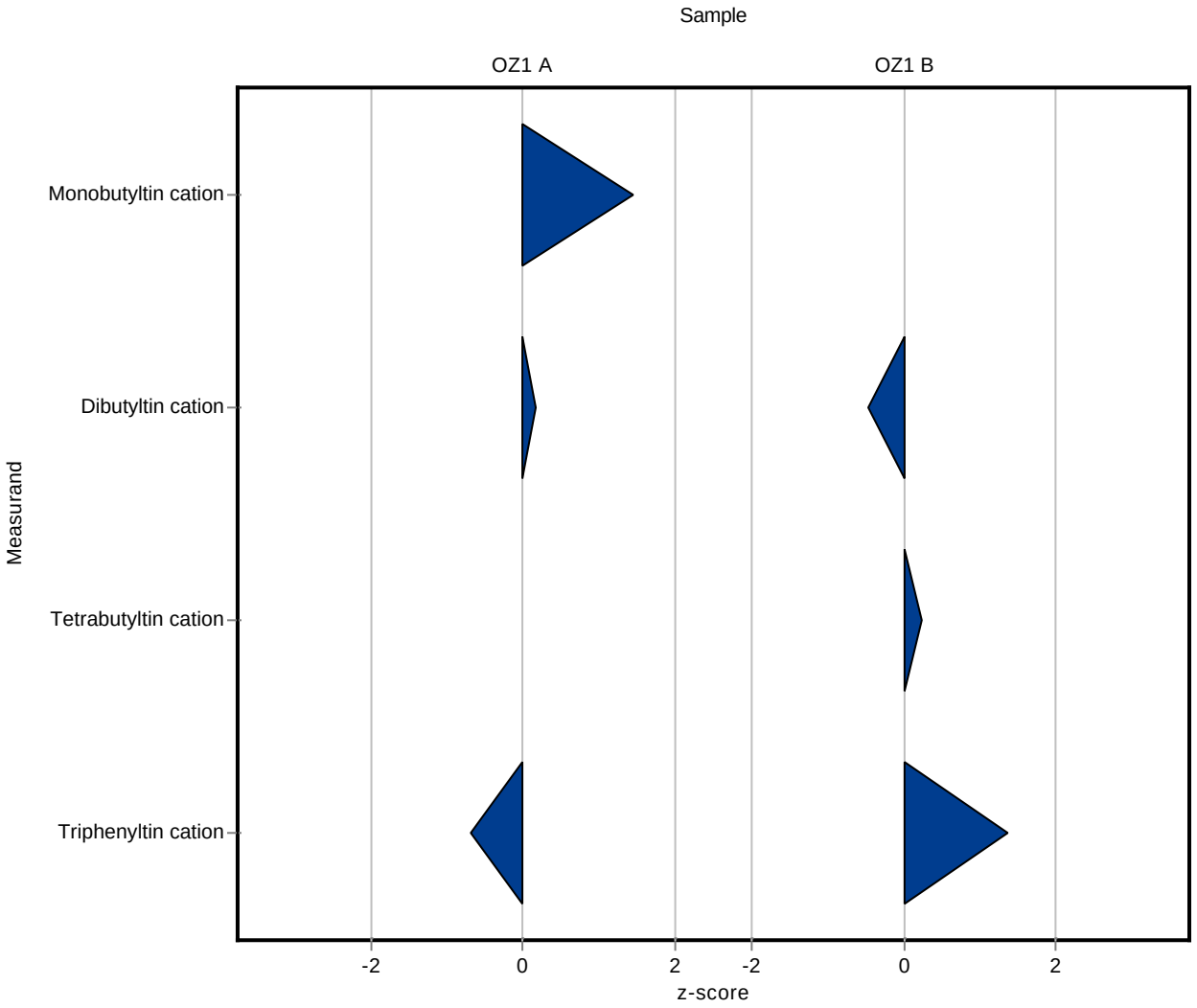
The following results were achieved:

Sample: OZ1A

Parameter	Unit	Target	±	CI(99%)	Result	± U	Criteria	Recovery	z-score
Monobutyltin cation	ng/l	36.3	±	24.4	69.6	34.8	23	191.8	1.45
Dibutyltin cation	ng/l	17.6	±	9.38	19.1	9.6	8.85	108.3	0.16
Tributyltin cation	ng/l	-	±	-	<2 (LOQ)	-	-	-	-
Tetrabutyltin cation	ng/l	-	±	-	<2 (LOQ)	-	-	-	-
Diphenyltin cation	ng/l	-	±	-	-	-	-	-	-
Triphenyltin cation	ng/l	21.3	±	12.3	13.9	6.9	10.8	65.1	-0.69

Sample: OZ1B

Parameter	Unit	Target	±	CI(99%)	Result	± U	Criteria	Recovery	z-score
Monobutyltin cation	ng/l	-	±	-	7.2	3.6	-	-	-
Dibutyltin cation	ng/l	4.25	±	3.71	2.7	1.4	3.28	63.5	-0.47
Tributyltin cation	ng/l	-	±	-	1.9	1	-	-	-
Tetrabutyltin cation	ng/l	1.76	±	0.742	1.9	1	0.606	107.8	0.23
Diphenyltin cation	ng/l	-	±	-	-	-	-	-	-
Triphenyltin cation	ng/l	2.43	±	1.23	3.8	1.9	1	156.7	1.37


Sample
OZ1 A
OZ1 B
Monobutyltin cation
Dibutyltin cation
Tetrabutyltin cation
Triphenyltin cation
Measurand
-2
0
2
-2
0
2
z-score

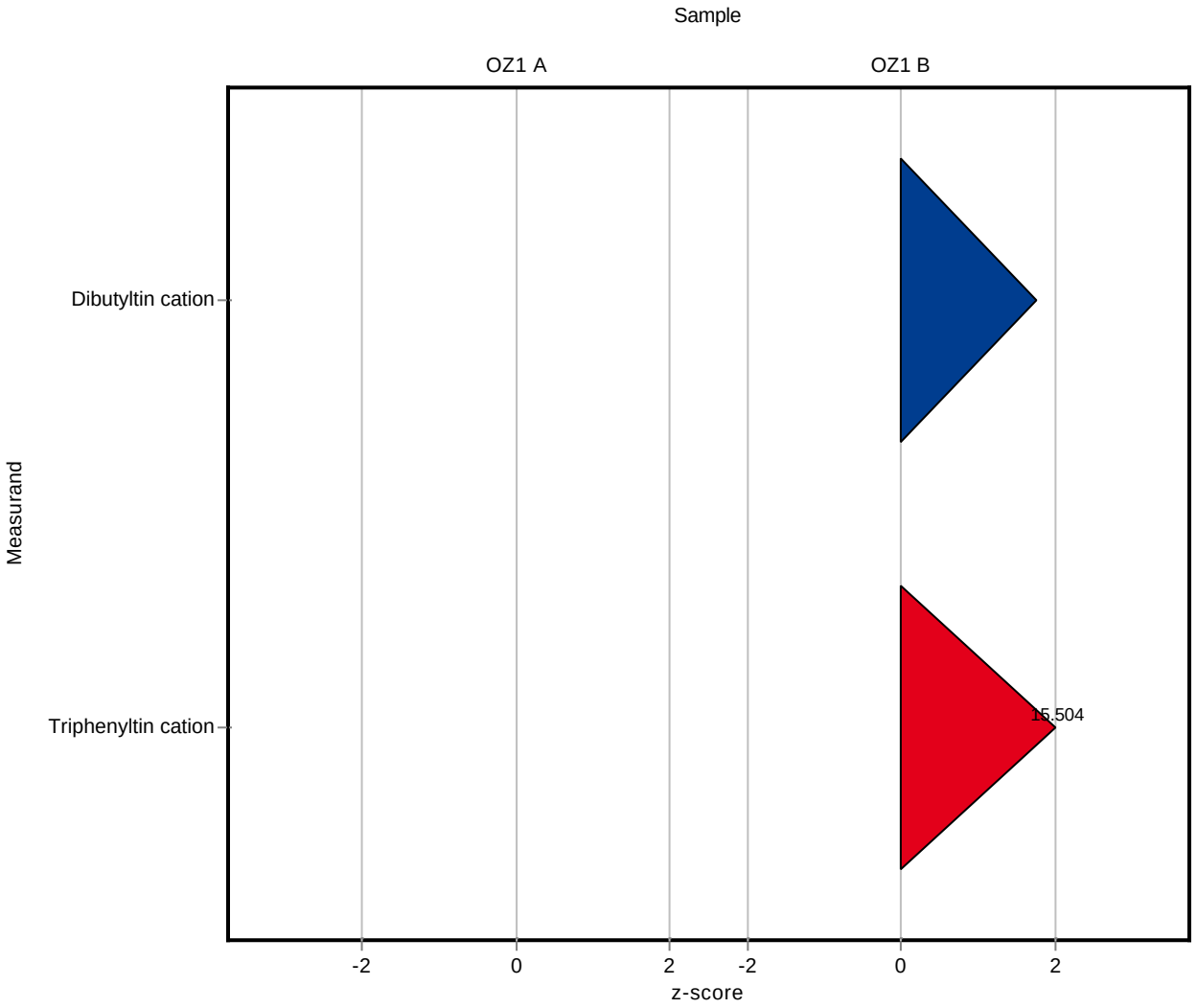
The following results were achieved:

Sample: OZ1A

Parameter	Unit	Target	±	CI(99%)	Result	± U	Criteria	Recovery	z-score
Monobutyltin cation	ng/l	36.3	±	24.4	<100 (LOQ)	-	23	-	-
Dibutyltin cation	ng/l	17.6	±	9.38	<100 (LOQ)	-	8.85	-	-
Tributyltin cation	ng/l	-	±	-	<100 (LOQ)	-	-	-	-
Tetrabutyltin cation	ng/l	-	±	-	<100 (LOQ)	-	-	-	-
Diphenyltin cation	ng/l	-	±	-	-	-	-	-	-
Triphenyltin cation	ng/l	21.3	±	12.3	<100 (LOQ)	-	10.8	-	-

Sample: OZ1B

Parameter	Unit	Target	±	CI(99%)	Result	± U	Criteria	Recovery	z-score
Monobutyltin cation	ng/l	-	±	-	30	13	-	-	-
Dibutyltin cation	ng/l	4.25	±	3.71	10	6.7	3.28	235.1	1.75
Tributyltin cation	ng/l	-	±	-	<10 (LOQ)	-	-	-	-
Tetrabutyltin cation	ng/l	1.76	±	0.742	<10 (LOQ)	-	0.606	-	-
Diphenyltin cation	ng/l	-	±	-	-	-	-	-	-
Triphenyltin cation	ng/l	2.43	±	1.23	18	8.8	1	742.3	15.50


Sample
OZ1 A
OZ1 B
Measurand
Dibutyltin cation
Triphenyltin cation
15.504
-2
0
2
-2
0
2
z-score

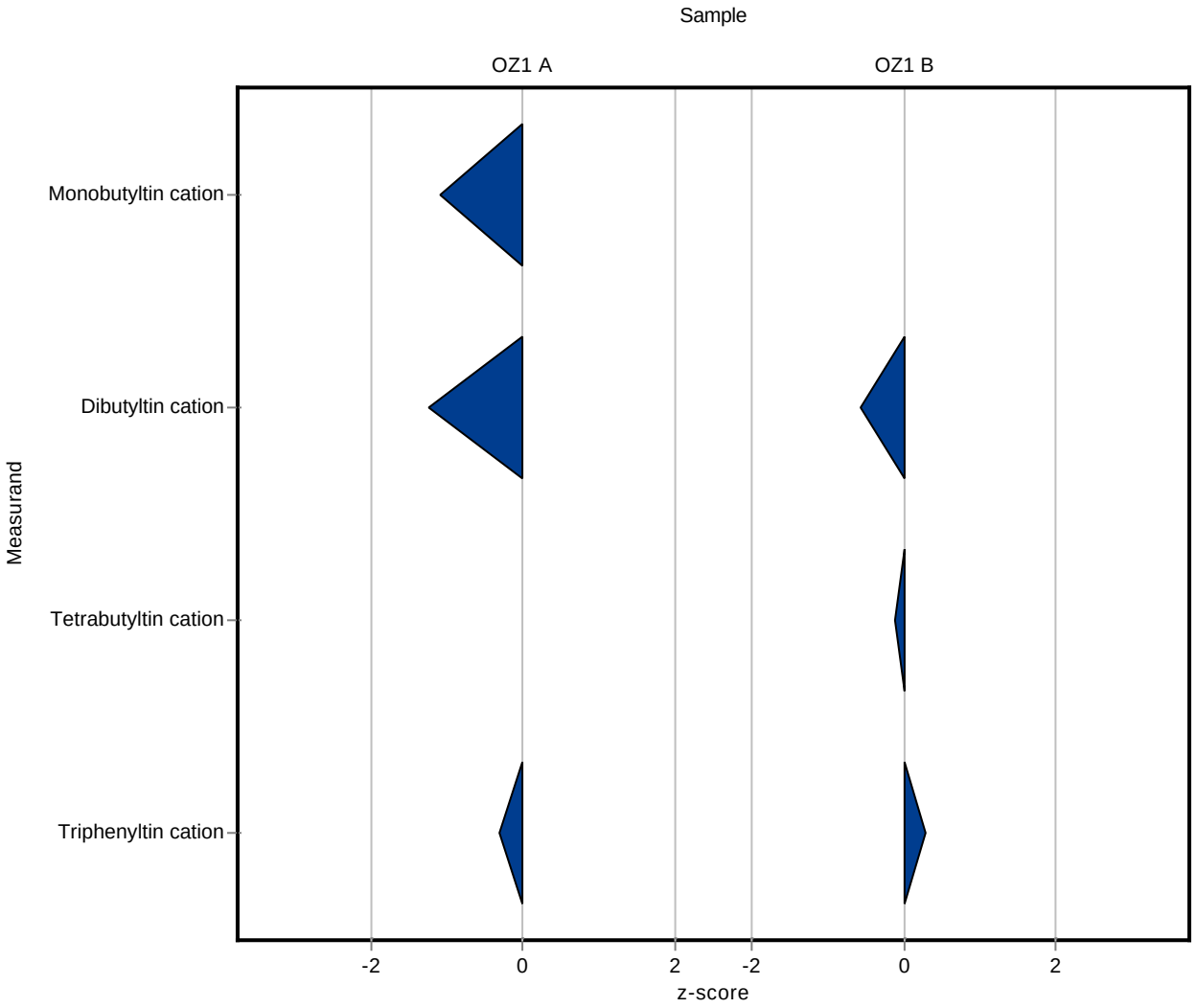
The following results were achieved:

Sample: OZ1A

Parameter	Unit	Target	±	CI(99%)	Result	± U	Criteria	Recovery	z-score
Monobutyltin cation	ng/l	36.3	±	24.4	11.1	6.6	23	30.6	-1.10
Dibutyltin cation	ng/l	17.6	±	9.38	6.6	3.9	8.85	37.4	-1.25
Tributyltin cation	ng/l	-	±	-	<1 (LOD)	-	-	-	-
Tetrabutyltin cation	ng/l	-	±	-	<1 (LOD)	-	-	-	-
Diphenyltin cation	ng/l	-	±	-	59.3	13.6	-	-	-
Triphenyltin cation	ng/l	21.3	±	12.3	17.9	4.1	10.8	83.9	-0.32

Sample: OZ1B

Parameter	Unit	Target	±	CI(99%)	Result	± U	Criteria	Recovery	z-score
Monobutyltin cation	ng/l	-	±	-	1.4	0.8	-	-	-
Dibutyltin cation	ng/l	4.25	±	3.71	2.4	1.4	3.28	56.4	-0.57
Tributyltin cation	ng/l	-	±	-	<1 (LOD)	-	-	-	-
Tetrabutyltin cation	ng/l	1.76	±	0.742	1.7	0.5	0.606	96.4	-0.10
Diphenyltin cation	ng/l	-	±	-	<1 (LOD)	-	-	-	-
Triphenyltin cation	ng/l	2.43	±	1.23	2.7	0.6	1	111.3	0.27


Sample
OZ1 A
OZ1 B
Monobutyltin cation
Dibutyltin cation
Tetrabutyltin cation
Triphenyltin cation
Measurand
-2
0
2
-2
0
2
z-score

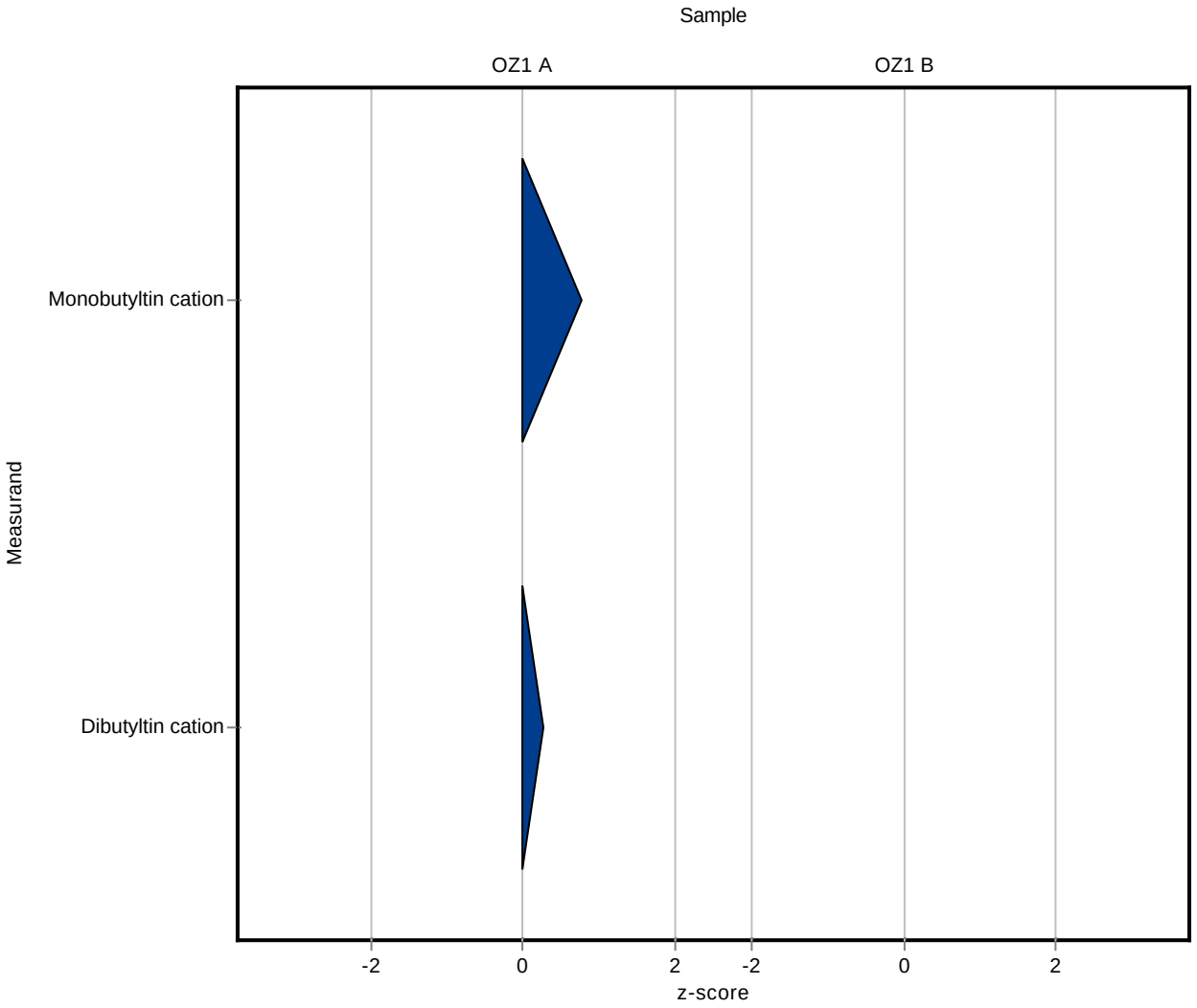
The following results were achieved:

Sample: OZ1A

Parameter	Unit	Target	±	CI(99%)	Result	± U	Criteria	Recovery	z-score
Monobutyltin cation	ng/l	36.3	±	24.4	54	7	23	148.8	0.77
Dibutyltin cation	ng/l	17.6	±	9.38	20	3	8.85	113.4	0.27
Tributyltin cation	ng/l	-	±	-	<10 (LOQ)	-	-	-	-
Tetrabutyltin cation	ng/l	-	±	-	<10 (LOQ)	-	-	-	-
Diphenyltin cation	ng/l	-	±	-	<10 (LOQ)	-	-	-	-
Triphenyltin cation	ng/l	21.3	±	12.3	<10 (LOQ)	-	10.8	-	-

Sample: OZ1B

Parameter	Unit	Target	±	CI(99%)	Result	± U	Criteria	Recovery	z-score
Monobutyltin cation	ng/l	-	±	-	<10 (LOQ)	-	-	-	-
Dibutyltin cation	ng/l	4.25	±	3.71	<10 (LOQ)	-	3.28	-	-
Tributyltin cation	ng/l	-	±	-	48	6	-	-	-
Tetrabutyltin cation	ng/l	1.76	±	0.742	<10 (LOQ)	-	0.606	-	-
Diphenyltin cation	ng/l	-	±	-	<10 (LOQ)	-	-	-	-
Triphenyltin cation	ng/l	2.43	±	1.23	<10 (LOQ)	-	1	-	-


Sample
OZ1 A
OZ1 B
Monobutyltin cation
Dibutyltin cation
Measurand
-2
0
2
-2
0
2
z-score