

Round-robin tests for in-house measuring laboratories

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Results and Evaluation

Round-robin test

„Organic solvents TYP B 2016“

Summary of laboratory test results

Sample 1

	o-Xylene Z score		Toluene Z score		Ethylbenzene Z score	
Unit	mg/tube		mg/tube		mg/tube	
6	0,182	-1,08	0,806	-0,78	0,282	-1,21
31	0,182	-1,08	0,772	-1,16	0,312	-0,28
73	0,200	-0,20	0,860	-0,16	0,350	0,91
96	0,399	9,56 BE	0,929	0,63	0,332	0,35
111	0,216	0,59	0,890	0,19	0,313	-0,25
114	0,170	-1,67	0,890	0,19	0,270	-1,59
138	0,250	2,25 E	0,930	0,64	0,380	1,84
223	0,228	1,18	0,913	0,45	0,328	0,22
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Method	ISO 5725-2		ISO 5725-2		ISO 5725-2	
Assessment	Z <=2,00		Z <=2,00		Z <=2,00	
Mean	0,204		0,874		0,321	
Reproducibility s.d.	0,029		0,058		0,035	
Rel. reproducibility s.d.	14,12 %		6,62 %		11,02 %	
Reference value	0,227		0,916		0,331	
Target s.d.	0,020		0,087		0,032	
Rel. target s.d.	10,00 %		10,00 %		10,00 %	
Lower limit of tolerance	0,163		0,699		0,257	
Upper limit of tolerance	0,245		1,049		0,385	
Type B outliers	1					
Number of laboratories with replicates outside of tolerance limits	2					
No. of laboratories that submitted results	8		8		8	
No. of laboratories after elimination of outliers type A-D and F (without laboratories that only gave states but no measured values)	7		8		8	
Explanation of outlier types						
A: Single outlier	Grubbs					
B: Differing laboratory mean	Grubbs					
C: Excessive laboratory s.d.	Cochran					
D: Excluded manually						
E: mean outside tolerance limits						
F: Z-Score >3,5						
L: Differing laboratory mean (Grubbs II)	Grubbs für 2					

Summary of laboratory test results

Sample 2

	o-Xylene Z score		n-Heptane Z score		n-Octane Z score		Ethylbenzene Z score	
Unit	mg/tube		mg/tube		mg/tube		mg/tube	
6	0,195	-1,29	0,836	-1,18	0,857	-1,14	0,307	-1,37
31	0,190	-1,52	0,577	-3,92 BE	0,958	-0,10	0,219	-3,84 FE
73	0,230	0,27	0,960	0,12	0,980	0,13	0,390	0,96
96	0,443	9,78 BE	0,937	-0,12	0,957	-0,11	0,369	0,37
111	0,245	0,94	0,908	-0,42	0,955	-0,13	0,346	-0,27
114	0,190	-1,52	1,000	0,55	1,010	0,44	0,300	-1,57
138	0,260	1,61	0,970	0,23	0,990	0,23	0,400	1,24
223	0,258	1,52	1,027	0,83	1,033	0,68	0,378	0,63
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Method	ISO 5725-2		ISO 5725-2		ISO 5725-2		ISO 5725-2	
Assessment	Z <=2,00		Z <=2,00		Z <=2,00		Z <=2,00	
Mean	0,224		0,948		0,967		0,356	
Reproducibility s.d.	0,032		0,063		0,053		0,040	
Rel. reproducibility s.d.	14,21 %		6,65 %		5,43 %		11,12 %	
Reference value	0,257		0,968		0,990		0,374	
Target s.d.	0,022		0,095		0,097		0,036	
Rel. target s.d.	10,00 %		10,00 %		10,00 %		10,00 %	
Lower limit of tolerance	0,179		0,759		0,774		0,285	
Upper limit of tolerance	0,269		1,138		1,161		0,427	
Type B outliers	1		1					
Number of laboratories with replicates outside of tolerance limits	1		1				1	
Type F outliers							1	
No. of laboratories that submitted results	8		8		8		8	
No. of laboratories after elimination of outliers type A-D and F (without laboratories that only gave states but no measured values)	7		7		8		7	
Explanation of outlier types								
A: Single outlier	Grubbs							
B: Differing laboratory mean	Grubbs							
C: Excessive laboratory s.d.	Cochran							
D: Excluded manually								
E: mean outside tolerance limits								
F: Z-Score >3,5								
L: Differing laboratory mean (Grubbs II)	Grubbs für 2							

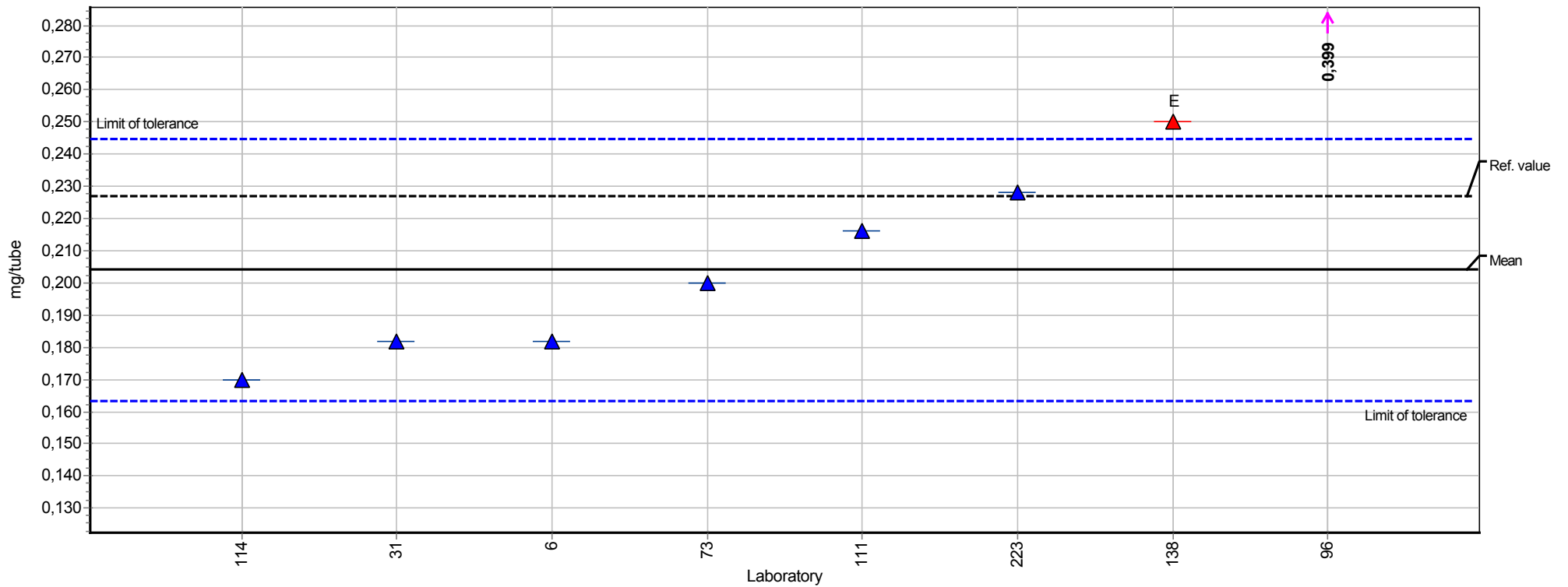
Summary of laboratory test results

Sample 3

	n-Hexane Z score		n-Octane Z score		n-Propyl acetate Z score	
Unit	mg/tube		mg/tube		mg/tube	
6	1,566	-0,97	1,029	-0,72	0,475	-1,15
31	1,692	-0,24	1,052	-0,51	0,562	0,47
73	1,620	-0,65	1,120	0,10	0,660	2,30 E
96	1,709	-0,14	1,095	-0,12	0,468	-1,28
111	1,650	-0,48	1,084	-0,22	0,520	-0,31
114	2,510	4,48 BE	1,740	5,70 BE	0,320	-4,04 FE
138	2,050	1,83	1,210	0,92	0,550	0,25
223	1,846	0,65	1,169	0,55	0,522	-0,27
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Method	ISO 5725-2		ISO 5725-2		ISO 5725-2	
Assessment	Z <=2,00		Z <=2,00		Z <=2,00	
Mean	1,733		1,108		0,537	
Reproducibility s.d.	0,165		0,064		0,065	
Rel. reproducibility s.d.	9,51 %		5,75 %		12,04 %	
Reference value	1,780		1,150		0,573	
Target s.d.	0,173		0,111		0,054	
Rel. target s.d.	10,00 %		10,00 %		10,00 %	
Lower limit of tolerance	1,387		0,887		0,429	
Upper limit of tolerance	2,080		1,330		0,644	
Type B outliers	1		1			
Number of laboratories with replicates outside of tolerance limits	1		1		2	
Type F outliers					1	
No. of laboratories that submitted results	8		8		8	
No. of laboratories after elimination of outliers type A-D and F (without laboratories that only gave states but no measured values)	7		7		7	
Explanation of outlier types						
A: Single outlier	Grubbs					
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F: Z-Score >3,5						
L: Differing laboratory mean (Grubbs II)	Grubbs für 2					

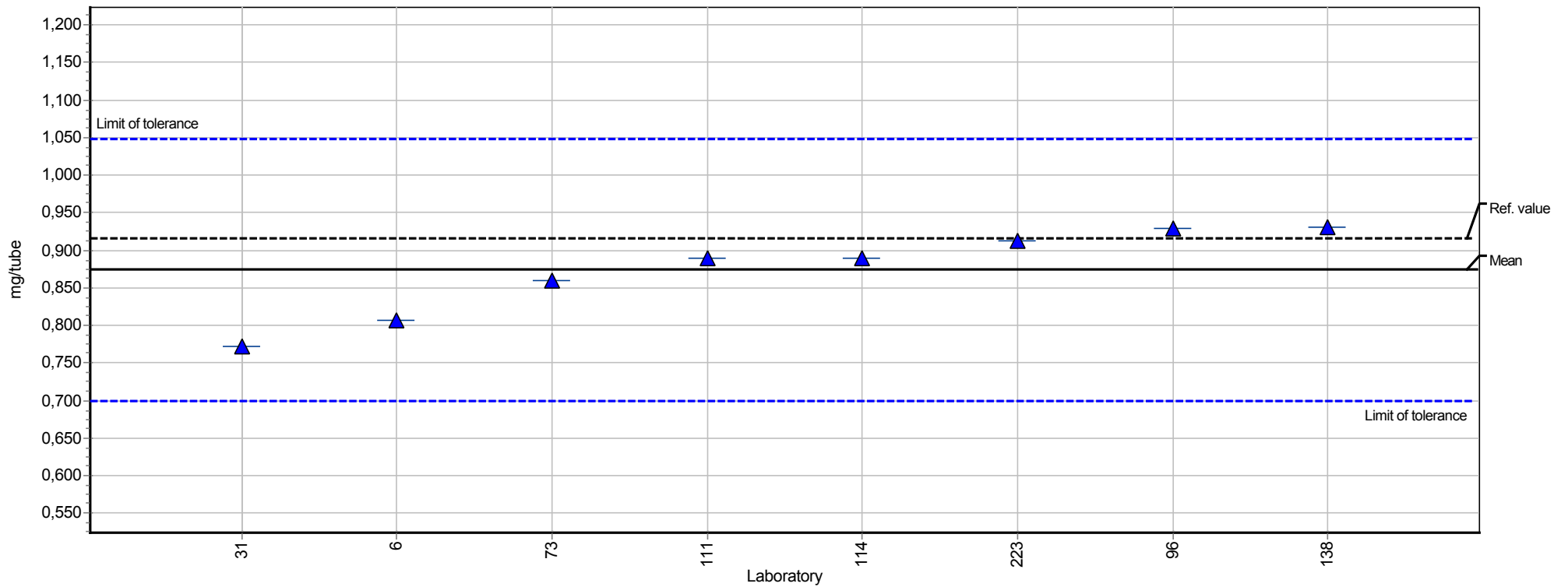
Summary results

Measurand:	o-Xylene	Mean:	0,204 mg/tube
Sample:	1	Reproducibility s.d.:	0,029 mg/tube
Method:	ISO 5725-2	Relative reproducibility s.d.:	14,12%
No. of laboratories:	7	Reference value:	0,227 mg/tube
Relative target s.d.:	10,00% (Limited)	Range of tolerance:	0,163 - 0,245 mg/tube ($ Z\text{-Score} \leq 2,00$)



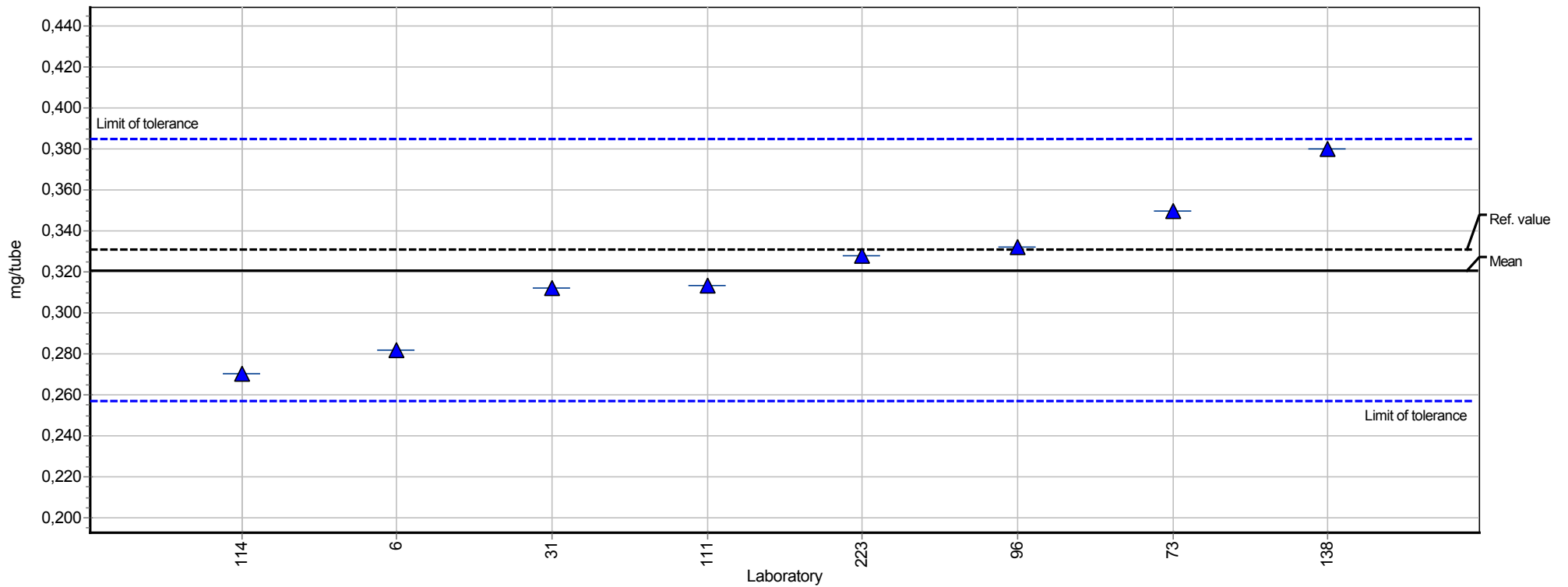
Summary results

Measurand:	Toluene	Mean:	0,874 mg/tube
Sample:	1	Reproducibility s.d.:	0,058 mg/tube
Method:	ISO 5725-2	Relative reproducibility s.d.:	6,62%
No. of laboratories:	8	Reference value:	0,916 mg/tube
Relative target s.d.:	10,00% (Limited)	Range of tolerance:	0,699 - 1,049 mg/tube ($ Z\text{-Score} \leq 2,00$)



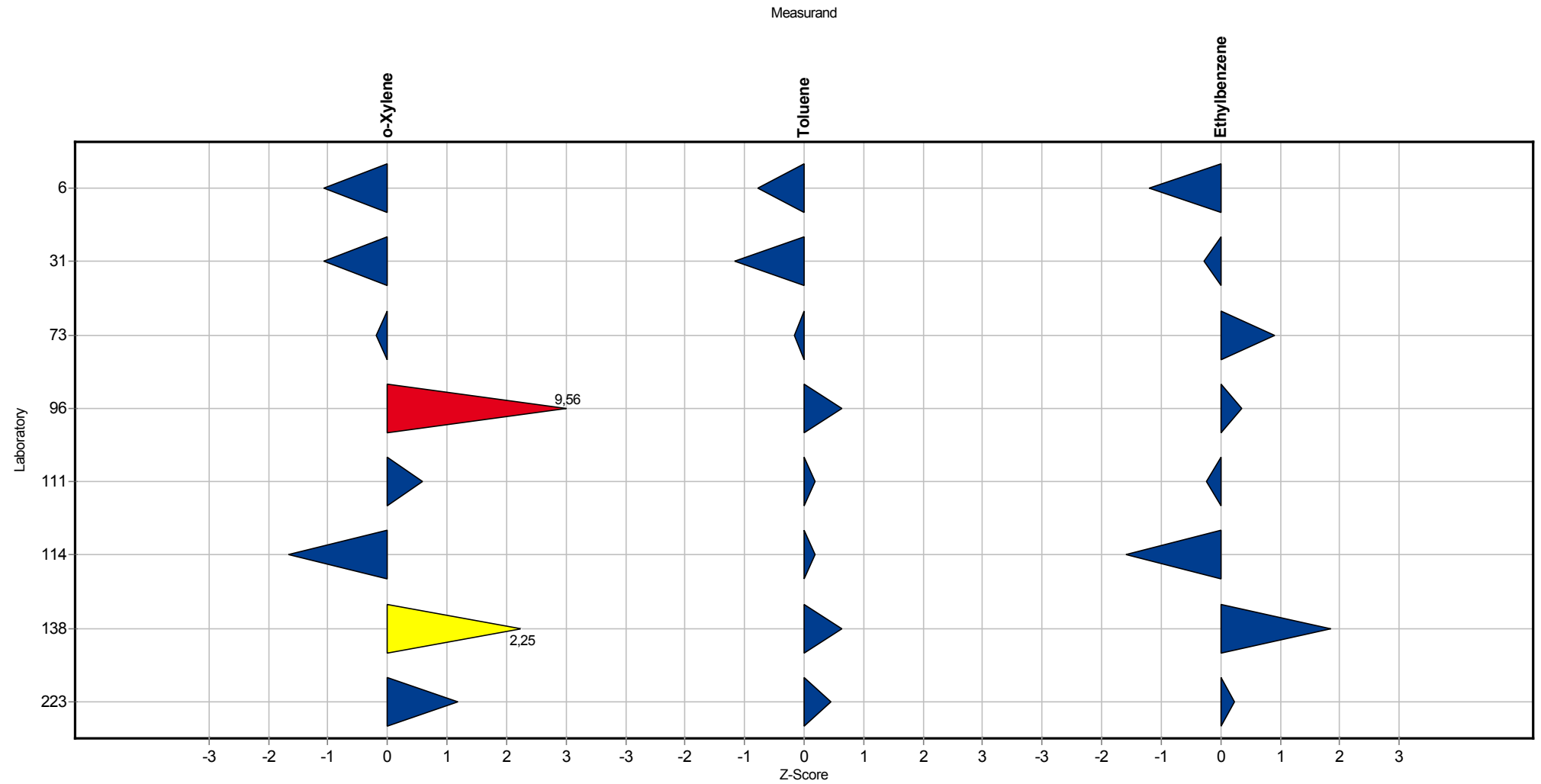
Summary results

Measurand:	Ethylbenzene	Mean:	0,321 mg/tube
Sample:	1	Reproducibility s.d.:	0,035 mg/tube
Method:	ISO 5725-2	Relative reproducibility s.d.:	11,02%
No. of laboratories:	8	Reference value:	0,331 mg/tube
Relative target s.d.:	10,00% (Limited)	Range of tolerance:	0,257 - 0,385 mg/tube ($ Z\text{-Score} \leq 2,00$)



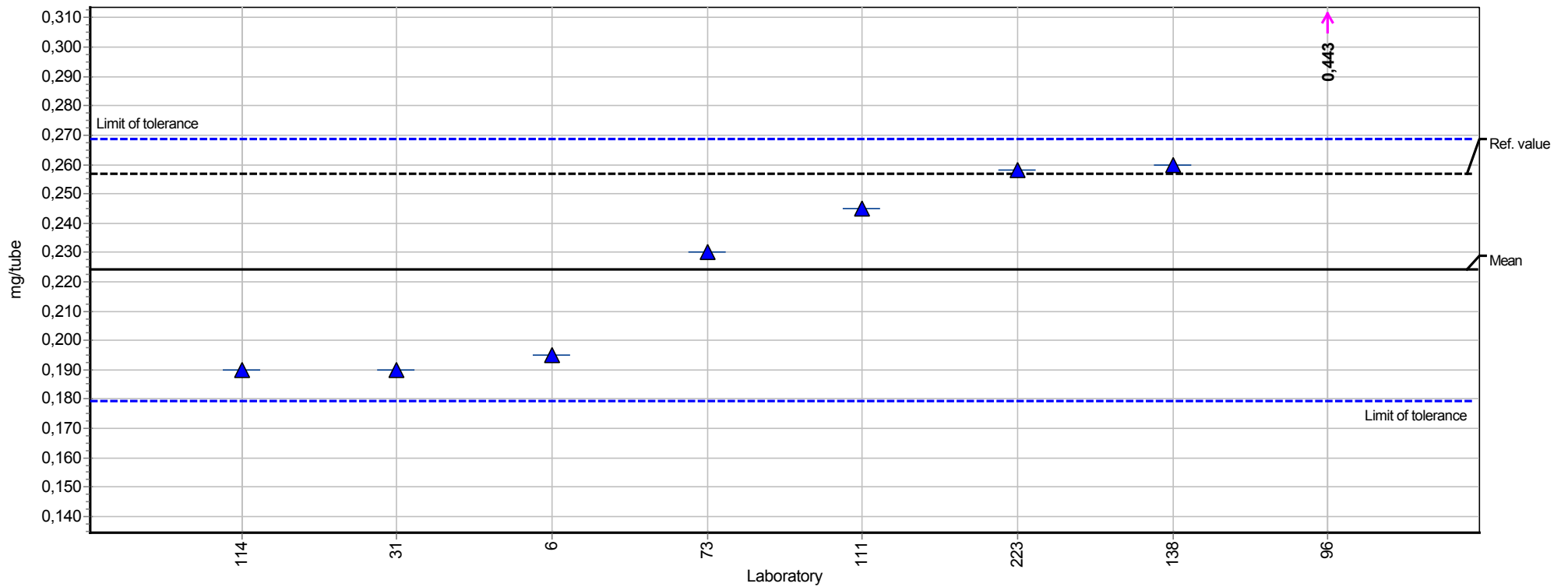
Sample chart of Z-scores

Sample 1



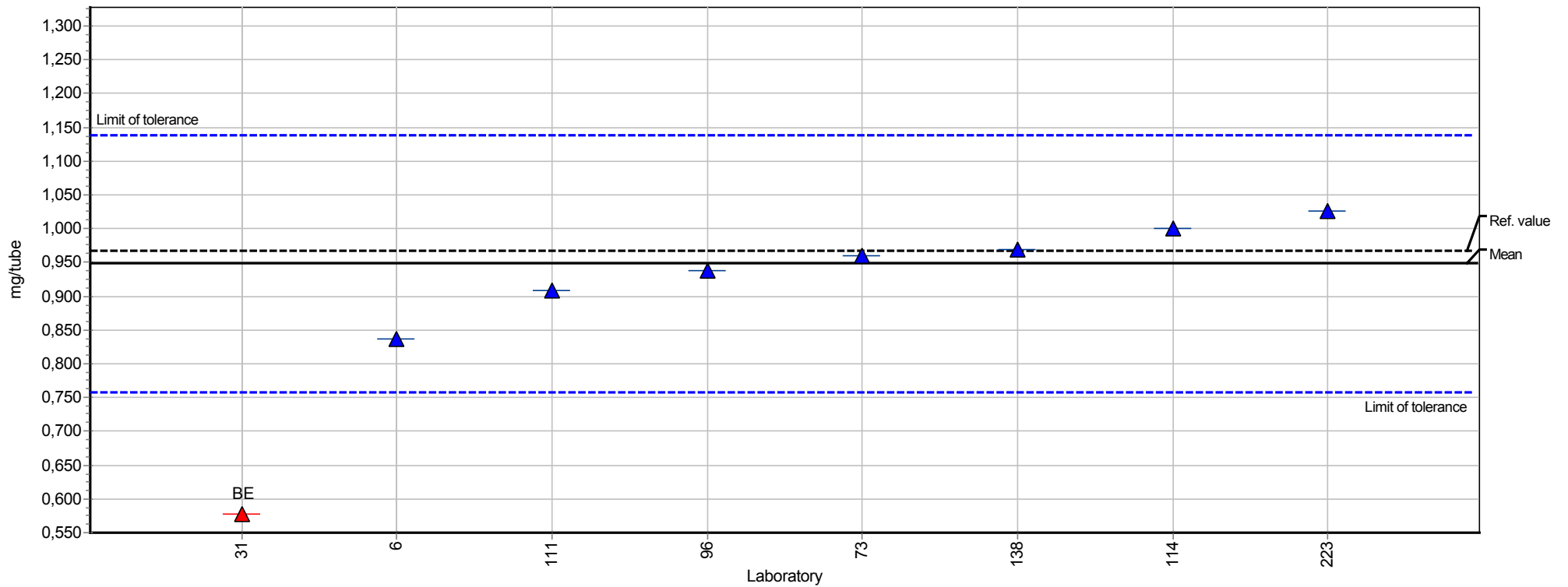
Summary results

Measurand:	o-Xylene	Mean:	0,224 mg/tube
Sample:	2	Reproducibility s.d.:	0,032 mg/tube
Method:	ISO 5725-2	Relative reproducibility s.d.:	14,21%
No. of laboratories:	7	Reference value:	0,257 mg/tube
Relative target s.d.:	10,00% (Limited)	Range of tolerance:	0,179 - 0,269 mg/tube ($ Z\text{-Score} \leq 2,00$)



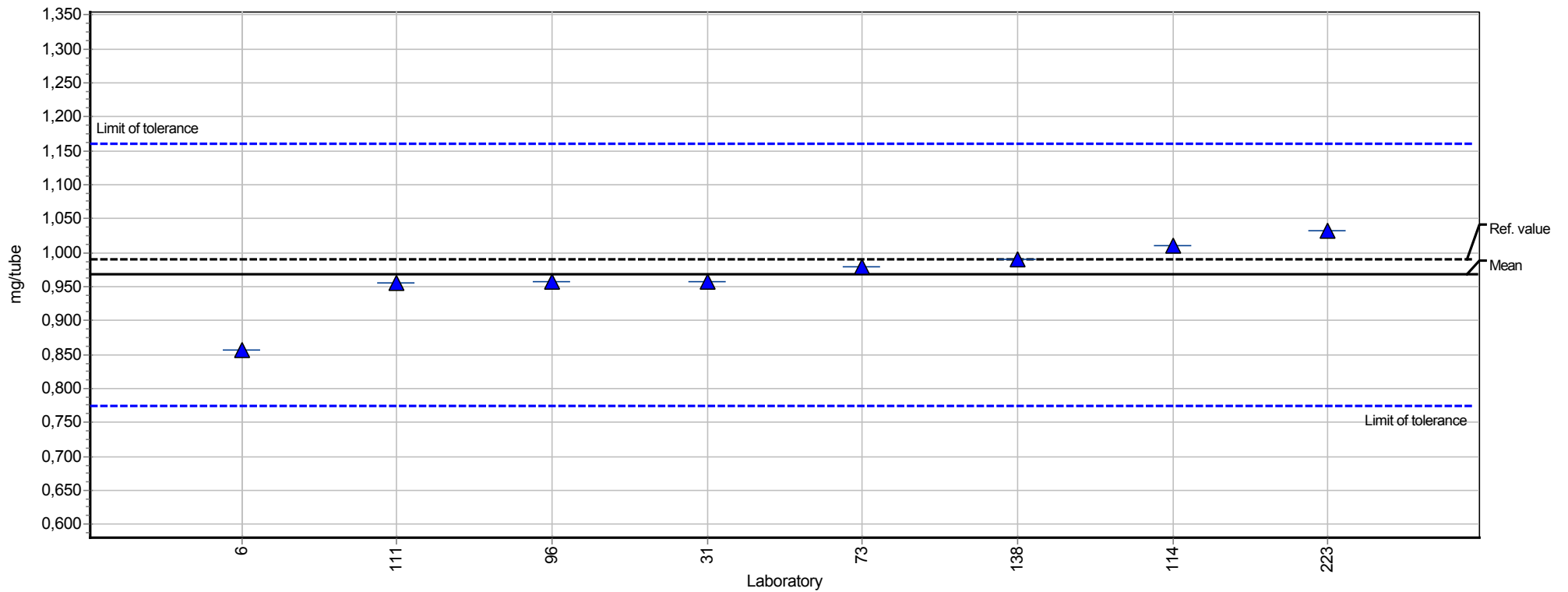
Summary results

Measurand:	n-Heptane	Mean:	0,948 mg/tube
Sample:	2	Reproducibility s.d.:	0,063 mg/tube
Method:	ISO 5725-2	Relative reproducibility s.d.:	6,65%
No. of laboratories:	7	Reference value:	0,968 mg/tube
Relative target s.d.:	10,00% (Limited)	Range of tolerance:	0,759 - 1,138 mg/tube ($ Z\text{-Score} \leq 2,00$)



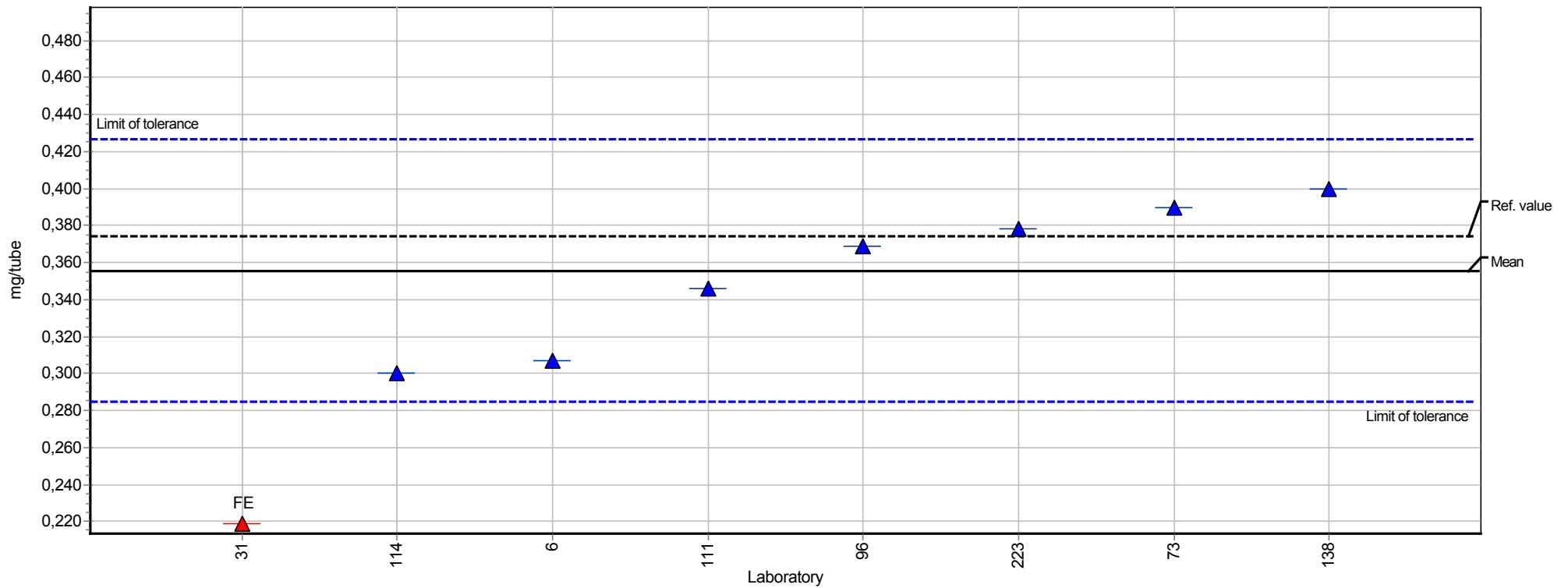
Summary results

Measurand:	n-Octane	Mean:	0,967 mg/tube
Sample:	2	Reproducibility s.d.:	0,053 mg/tube
Method:	ISO 5725-2	Relative reproducibility s.d.:	5,43%
No. of laboratories:	8	Reference value:	0,990 mg/tube
Relative target s.d.:	10,00% (Limited)	Range of tolerance:	0,774 - 1,161 mg/tube ($ Z\text{-Score} \leq 2,00$)



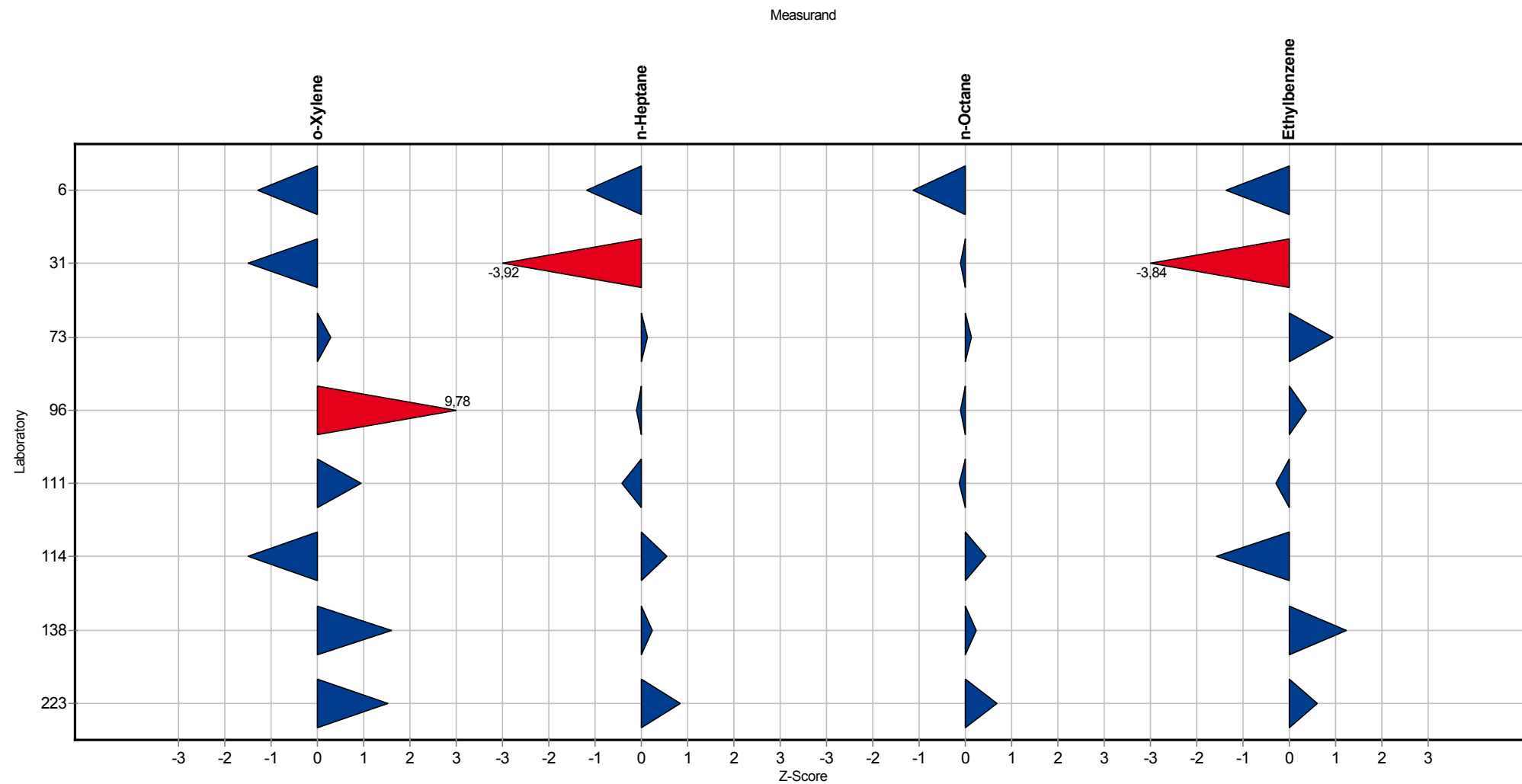
Summary results

Measurand:	Ethylbenzene	Mean:	0,356 mg/tube
Sample:	2	Reproducibility s.d.:	0,040 mg/tube
Method:	ISO 5725-2	Relative reproducibility s.d.:	11,12%
No. of laboratories:	7	Reference value:	0,374 mg/tube
Relative target s.d.:	10,00% (Limited)	Range of tolerance:	0,285 - 0,427 mg/tube ($ Z\text{-Score} \leq 2,00$)



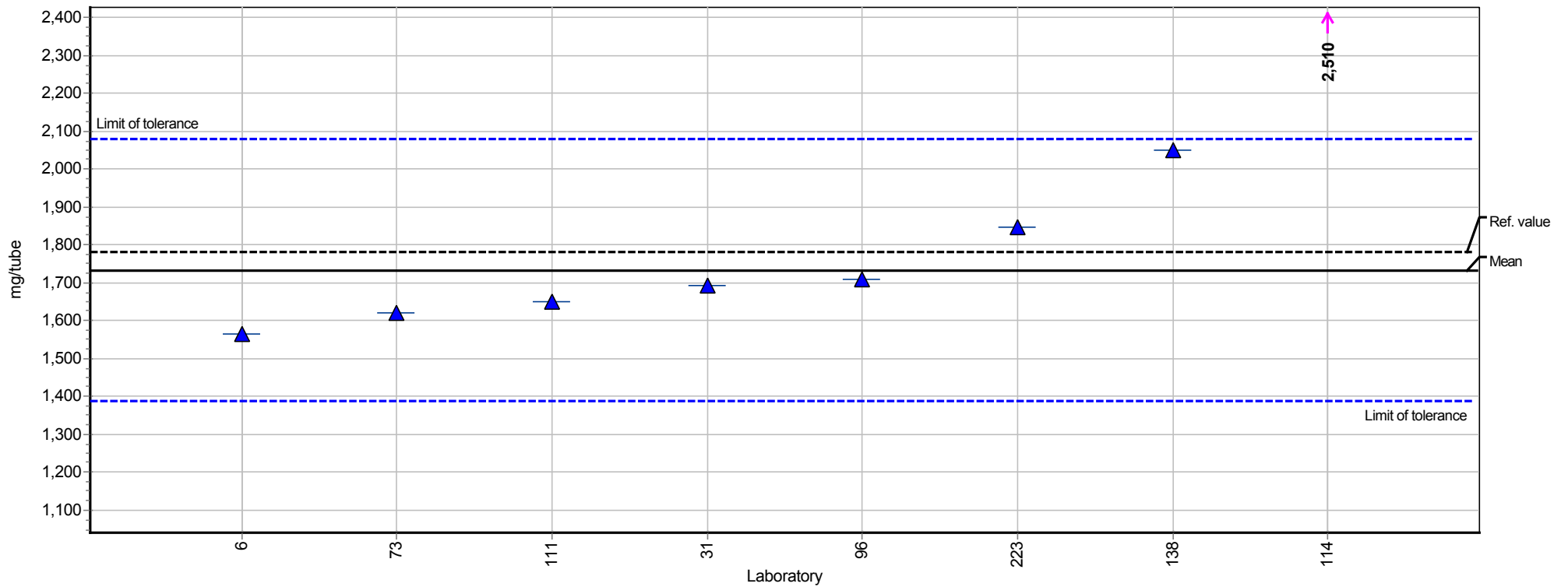
Sample chart of Z-scores

Sample 2



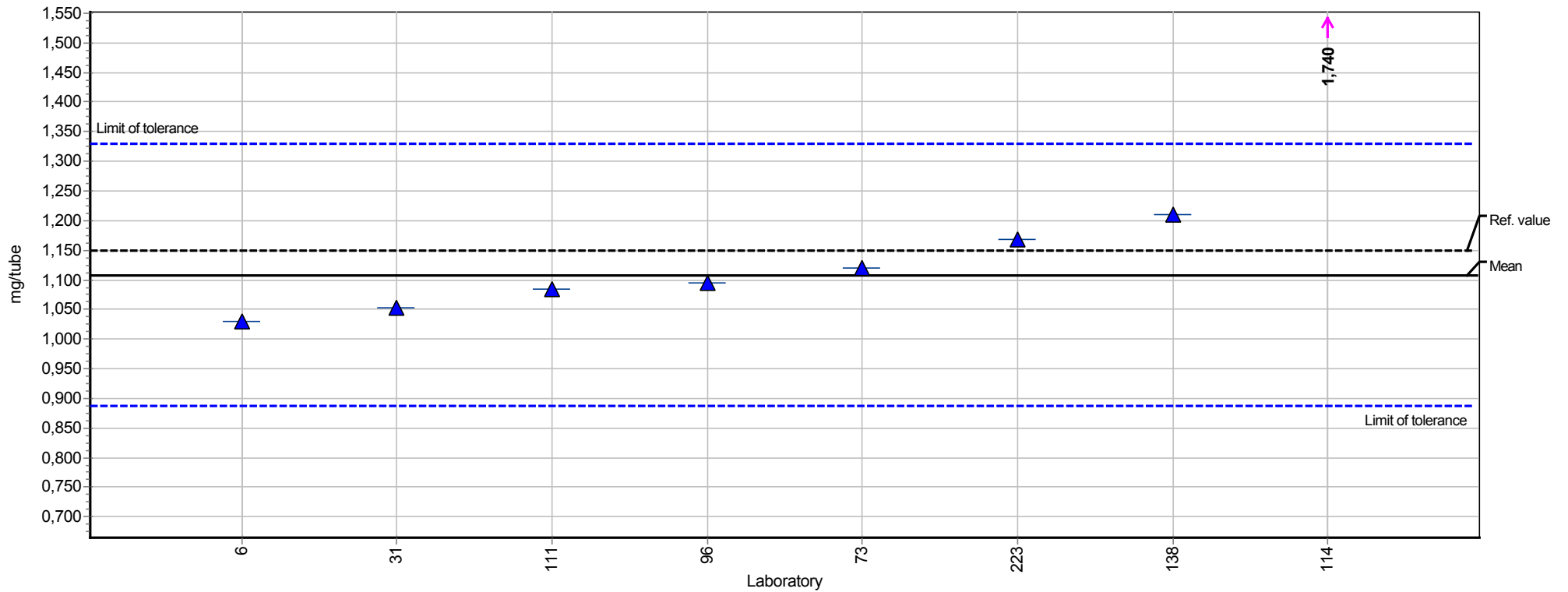
Summary results

Measurand:	n-Hexane	Mean:	1,733 mg/tube
Sample:	3	Reproducibility s.d.:	0,165 mg/tube
Method:	ISO 5725-2	Relative reproducibility s.d.:	9,51%
No. of laboratories:	7	Reference value:	1,780 mg/tube
Relative target s.d.:	10,00% (Limited)	Range of tolerance:	1,387 - 2,080 mg/tube ($ Z\text{-Score} \leq 2,00$)



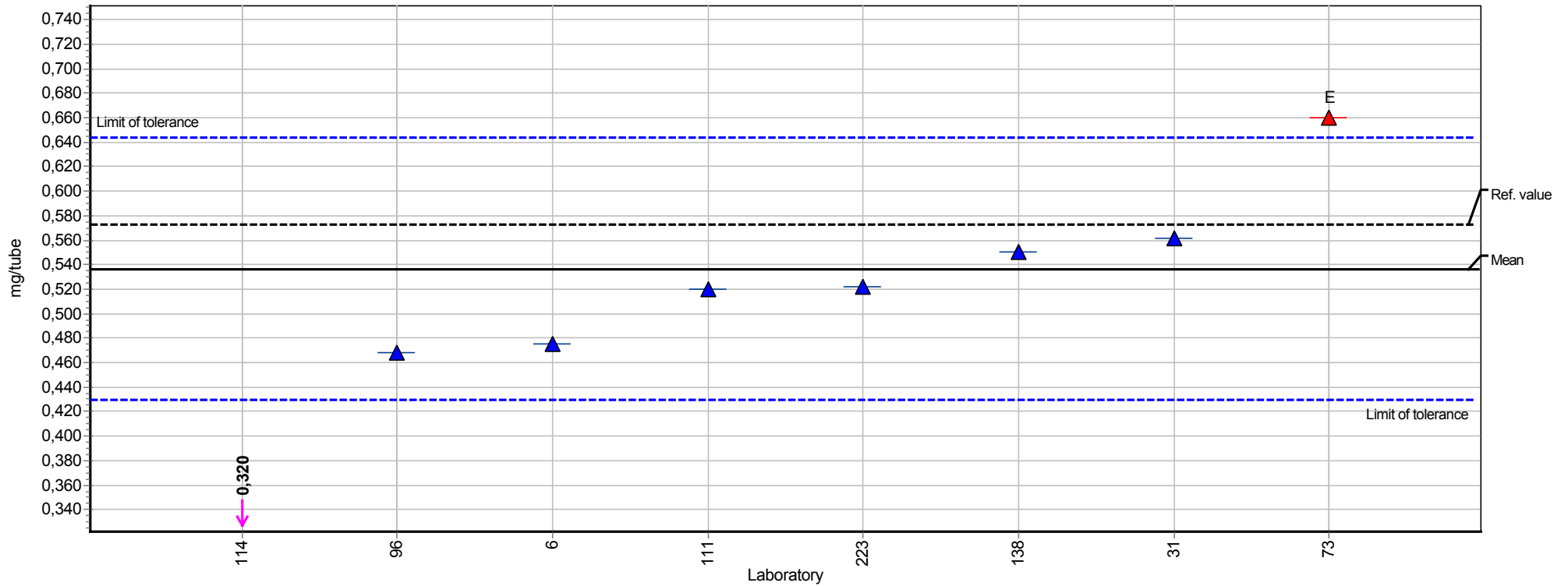
Summary results

Measurand:	n-Octane	Mean:	1,108 mg/tube
Sample:	3	Reproducibility s.d.:	0,064 mg/tube
Method:	ISO 5725-2	Relative reproducibility s.d.:	5,75%
No. of laboratories:	7	Reference value:	1,150 mg/tube
Relative target s.d.:	10,00% (Limited)	Range of tolerance:	0,887 - 1,330 mg/tube ($ Z\text{-Score} \leq 2,00$)



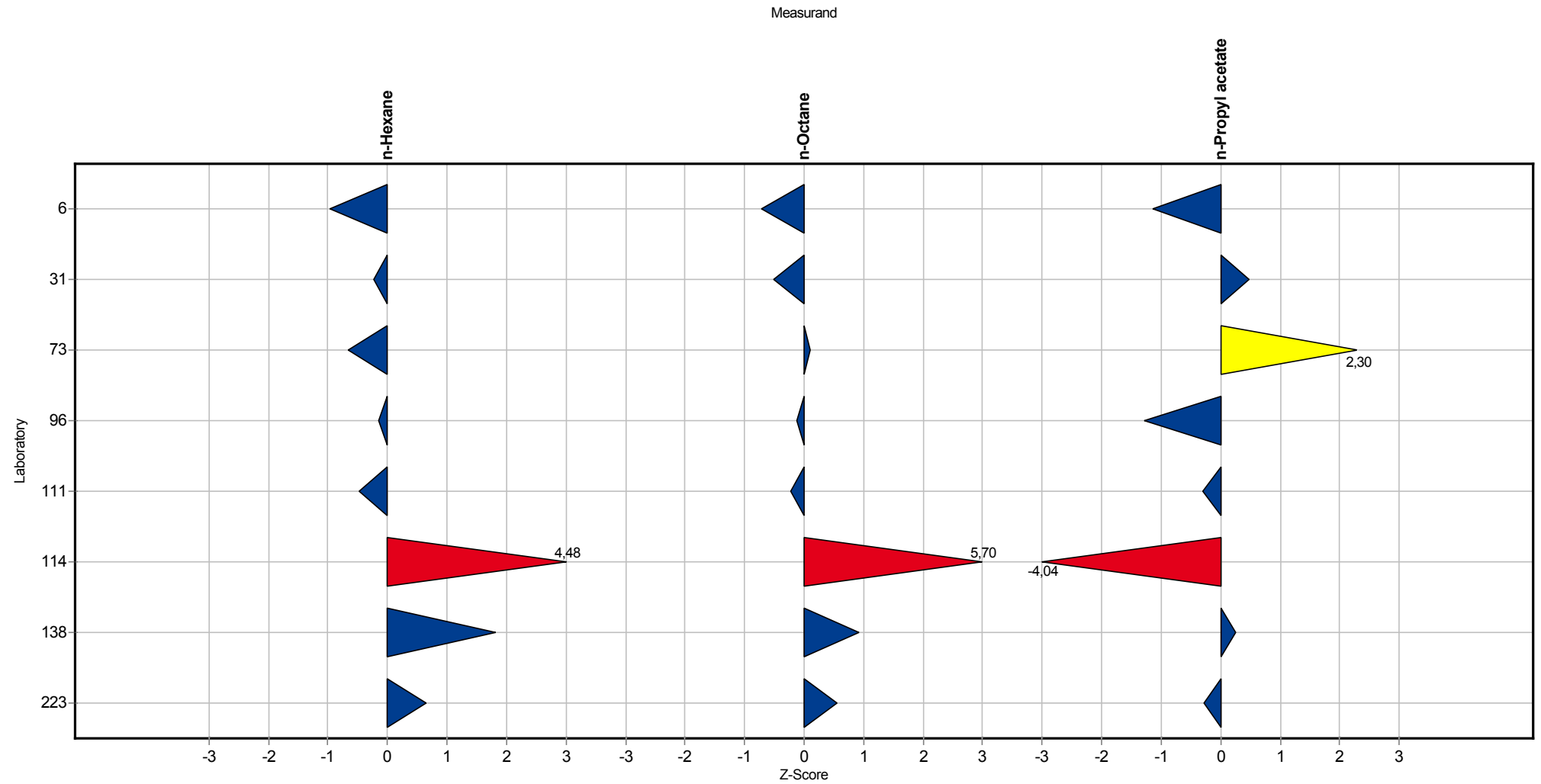
Summary results

Measurand:	n-Propyl acetate	Mean:	0,537 mg/tube
Sample:	3	Reproducibility s.d.:	0,065 mg/tube
Method:	ISO 5725-2	Relative reproducibility s.d.:	12,04%
No. of laboratories:	7	Reference value:	0,573 mg/tube
Relative target s.d.:	10,00% (Limited)	Range of tolerance:	0,429 - 0,644 mg/tube ($ Z\text{-Score} \leq 2,00$)



Sample chart of Z-scores

Sample 3



Questions and Answers

Participant	Analytical method	Desorption solution	Volume of desorption solution	Carrier gas	Injection
6	IFA-Arbeitsmappe	Schwefelkohlenstoff	10 mL	Helium	splitless
31	IFA-Arbeitsmappe	Dichlormethan: Schwefelkohlenstoff: Methanol 60:35:5	10 mL	Helium	split
73	keine Bestimmte, Desorptionsmittel müsste für alle geeignet sein	Schwefelkohlenstoff + ISTD (n-Nonan ca.1.5 mg/ml)	ca. 2ml	Helium	split
96	Hausmethode	Schwefelkohlenstoff	3ml	Helium	1µl
111	IFA 7732, 7733, 7322	ternäres Gemisch	2 ml	Helium	split
114	LAB REF 27	CS2	5ml	he	spiltless
138	BGIA- Verfahren 7732, 7733, 7322	ternäres Gemisch CH2Cl2, CS2, CH3OH	2 ml AS 7 5 ml KS	Stickstoff	Split
223	DIN CEN/TS 13649 (3/2015)	Schwefelkohlenstoff	4 ml	Stickstoff	splitless

Participant	Analytical column	Detector	Data evaluation	Recovery rate	Date of analysis
6	OPTIMA-delta-3, DB-624	FID	interner Standard	ja	26.02.2016
31	60m RTX-5 und 60m HP Innowax	FID	interner Standard	ja	29.02.2016
73	DB-5 MS / 60m	FID	interner Standard	Nein	07.03.2016
96	DB1 30m; 0,32 mm; 3µm	FID	interner Standard	Kalibrierung mit Aktivkohle (Standard wurde wie Probe behandelt)	21-23.3.2016
111	RTX 5	MS	interner Standard	ja	02./03.03.16
114	Elite5MS 60m 0.25mm 1µm	FID and MS	external standart	no	04/03/16
138	2 Säulen unterschiedlicher Polarität	FID	beides	ja	bis zum 30.03.2016
223	Petrocol DH 50.2, 50 m x 0,2 mm, 0,5 µm Filmdicke	FID	interner Standard	ja	16.03.2016