IFA
Institut für Arbeitsschutz der
Deutschen Gesetzlichen Unfallversicherung

Proficiency testing for in-house and external measuring stations - results and evaluation

Proficiency testing scheme organic solvents

with and without own sampling

February 2025

2. Version, corrected values, May 2025

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Summary of laboratory test results

Sample 1

Laboratory	1-Butanol	Z score	1-Methoxy-2-Propanol	Z score	1-Propanol	Z score	2-Butanol	Z score	2-Propanol	Z score	i-Butanol	Z score
Unit	mg/m³		mg/m³		mg/m³		mg/m³		mg/m³		mg/m³	
4	104.0	-1.04	90.90	-0.31	82.8	-2.25 BE	49.80	-0.77	79.40	-0.57	40.80	-0.75
5	116.0	0.00	83.35	-1.11	98.8	-0.76	51.17	-0.52	79.37	-0.57	43.58	-0.12
68	51.7	-5.55 BE	35.99	-6.16 BE	35.3	-6.70 BE	26.96	-5.00 BE	34.80	-5.87 BE	19.71	-5.53 BE
72	117.5	0.13	91.35	-0.26	104.4	-0.23	73.88	3.69 BE	85.14	0.11	44.35	0.05
73	117.1	0.09	94.67	0.09	104.8	-0.19	54.14	0.03	84.57	0.04	43.57	-0.13
78	128.6	1.08	98.99	0.55	111.8	0.46	57.48	0.65	89.14	0.59	45.36	0.28
80	120.0	0.34	97.00	0.34	110.0	0.29	55.00	0.19	86.00	0.21	45.00	0.20
111	125.0	0.77	94.00	0.02	112.0	0.48	58.00	0.75	90.00	0.69	47.00	0.65
118	110.0	-0.52			96.4	-0.98	47.38	-1.22	77.34	-0.82	38.25	-1.33
131	119.0	0.26	93.17	-0.07	108.1	0.12	54.72	0.14	87.04	0.34	43.25	-0.20
138	125.0	0.77	104.00	1.09	113.0	0.57	56.70	0.51	90.10	0.70	48.90	1.08
154	112.2	-0.33	78.20	-1.66	106.0	-0.08	50.80	-0.59	76.90	-0.87	45.90	0.40
167	200.0	7.24 BE	103.00	0.98	172.0	6.09 BE	70.00	2.97 BE	111.00	3.18 BE	58.00	3.14 BE
199	104.5	-0.99	88.50	-0.56							42.90	-0.28
208	121.6	0.48	99.30	0.59	108.2	0.12	54.20	0.04	85.50	0.15	43.70	-0.10
222	118.4	0.20	95.10	0.14	109.4	0.24	53.10	-0.16	85.00	0.09	43.10	-0.23
234	118.7	0.23	93.43	-0.04	106.1	-0.08	53.03	-0.17	83.33	-0.10	42.93	-0.27
238	94.1	-1.89	65.80	-2.98 BE	90.0	-1.58	41.80	-2.25 BE	67.80	-1.95	34.60	-2.16 BE
242	117.6	0.13	92.89	-0.10	105.3	-0.14	54.62	0.12	84.82	0.07	43.52	-0.14
244	115.7	-0.03	93.40	-0.04	106.8	-0.01	55.60	0.30	87.20	0.36	45.90	0.40
245	108.7	-0.63	85.10	-0.93	98.5	-0.78	50.00	-0.74	79.10	-0.61	39.50	-1.05
252									87.80	0.43		
256	87.4	-2.47 E	93.00	-0.08	116.9	0.94	53.70	-0.05	88.70	0.53	43.80	-0.07
271	121.5	0.47	90.99	-0.30	111.6	0.44	54.04	0.01	86.48	0.27	44.02	-0.02
298	123.0	0.60	109.30	1.65	110.7	0.36	55.10	0.21	87.00	0.33	46.80	0.61
301									70.32	-1.65		
302	142.8	2.31 E	152.82	6.29 BE	115.6	0.82	60.77	1.26	102.82	2.21 E	48.72	1.04
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Laboratory	1-Butanol	Z score	1-Methoxy-2-Propanol	Z score	1-Propanol	Z score	2-Butanol	Z score	2-Propanol	Z score	i-Butanol	Z score
Method	ISO 5725-2		ISO 5725-2		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		|Z|<=2.00		|Z|<=2.00	
No. of laboratories that submitted results	25		24		24		24		26		25	
Mean	116.0		93.79		106.9		53.97		84.20		44.13	
Reproducibility s.d.	11.4		7.00		6.6		3.12		7.06		2.59	
Rel. reproducibility s.d.	9.85 %		7.46 %		6.16 %		5.77 %		8.38 %		5.87 %	
Reference value	131.6		96.80		116.0		59.40		92.70		49.60	
Target s.d.	11.6		9.38		10.7		5.40		8.42		4.41	
Rel. target s.d.	10.00 %		10.00 %		10.00 %		10.00 %		10.00 %		10.00 %	
Lower limit of tolerance	92.8		75.03		85.5		43.17		67.36		35.30	
Upper limit of tolerance	139.2		112.55		128.3		64.76		101.04		52.96	
Type B outliers	2		3		3		4		2		3	
Type E outliers	4		3		3		4		3		3	
No. of laboratories after elimination of outliers type A-D and F (without laboratories that only gave states but no measured values)	23		21		21		20		24		22	

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|>3.50	

Summary of laboratory test results

Sample 2

Laboratory	1,2,3-Trimethylbenzene	Z score	Cumene	Z score	Cyclohexane	Z score	Ethylacetate	Z score	m-Xylene	Z score
Unit	mg/m³		mg/m³		mg/m³		mg/m³		mg/m³	
4	46.70	0.33	28.00	1.10	66.20	0.31	61.70	-2.98 E	41.80	0.25
5	49.89	0.81	24.41	-0.33	64.16	0.00	88.55	0.08	40.73	-0.01
55	41.50	-0.45	24.40	-0.33	59.20	-0.78			37.40	-0.82
68					46.63	-2.74 BE	49.13	-4.41 FE		
72	38.76	-0.86	24.50	-0.29	54.66	-1.48	78.58	-1.06	39.39	-0.34
73	41.57	-0.44	24.82	-0.16	60.97	-0.50	85.73	-0.24	40.66	-0.03
78	49.38	0.73	27.50	0.90	62.14	-0.32	90.51	0.30	43.72	0.73
80	45.00	0.08	25.00	-0.09	63.00	-0.19	89.00	0.13	42.00	0.30
111	46.00	0.22	25.00	-0.09	73.00	1.37	101.00	1.49	41.00	0.06
118	41.40	-0.46	21.26	-1.57	56.70	-1.17			36.17	-1.13
131	47.94	0.52	26.78	0.61	65.58	0.22	94.81	0.79	42.71	0.48
138	41.80	-0.40	26.40	0.46	70.80	1.03	94.10	0.71	42.20	0.35
154	35.70	-1.32	22.00	-1.28	70.20	0.94	86.70	-0.13	34.30	-1.59
162	45.15	0.10	24.64	-0.23	66.20	0.31			41.77	0.25
167	51.00	0.97	26.00	0.31	65.00	0.13	119.00	3.54 FE	42.00	0.30
199	40.70	-0.57	25.60	0.15					45.20	1.09
208	48.80	0.64	27.80	1.02	64.40	0.03	90.70	0.32	41.10	0.08
222	52.20	1.15	25.60	0.15	67.70	0.55	90.80	0.33	42.30	0.38
234	44.78	0.04	24.88	-0.14	64.68	0.08	89.55	0.19	42.29	0.37
238	46.30	0.27	28.60	1.34	71.80	1.19	75.70	-1.38	46.30	1.36
239			25.10	-0.05	72.70	1.33			50.70	2.44 BE
242	41.86	-0.40	24.40	-0.33	61.48	-0.42	84.70	-0.36	40.25	-0.13
244	43.80	-0.10	26.20	0.38	63.50	-0.11	89.10	0.14	41.10	0.08
245	43.40	-0.16	24.70	-0.21	59.60	-0.72	86.80	-0.12	39.10	-0.41
252							88.60	0.08		
256	41.70	-0.42	23.30	-0.76	61.30	-0.45	79.90	-0.91	38.00	-0.68
271	39.25	-0.79	24.89	-0.13	57.49	-1.04	83.99	-0.44	37.77	-0.73
298	47.90	0.51	24.20	-0.41	62.30	-0.29	90.90	0.35	39.80	-0.24

Laboratory	1,2,3-Trimethylbenzene	Z score	Cumene	Z score	Cyclohexane	Z score	Ethylacetate	Z score	m-Xylene	Z score
302	140.87	14.44 BE	36.11	4.31 BE	100.00	5.58 BE	111.63	2.70 E	57.07	4.00 BE
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Method	ISO 5725-2		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		|Z|<=2.00	
No. of laboratories that submitted results	26		27		27		24		27	
Mean	44.50		25.23		64.19		87.87		40.76	
Reproducibility s.d.	4.14		1.69		4.94		9.46		2.67	
Rel. reproducibility s.d.	9.30 %		6.68 %		7.69 %		10.76 %		6.56 %	
Reference value	50.90		25.70		63.80		93.40		43.20	
Target s.d.	6.67		2.52		6.42		8.79		4.08	
Rel. target s.d.	15.00 %		10.00 %		10.00 %		10.00 %		10.00 %	
Lower limit of tolerance	31.15		20.18		51.35		70.29		32.61	
Upper limit of tolerance	57.85		30.28		77.03		105.44		48.91	
Type B outliers	1		1		2				2	
Type E outliers	1		1		2		4		2	
Type F outliers							2			
No. of laboratories after elimination of outliers type A-D and F (without laboratories that only gave states but no measured values)	25		26		25		22		25	

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|>3.50	

Laboratory	n-Decane	Z score	n-Heptane	Z score	Toluene	Z score
Unit	mg/m³		mg/m³		mg/m³	
4	77.20	1.70	72.80	3.00 E	31.60	0.45
5	64.03	-0.30	54.73	-0.23	30.04	-0.07
55	64.40	-0.24	51.70	-0.77	28.00	-0.74
68			37.41	-3.32 E		
72	61.19	-0.73	48.86	-1.28	28.52	-0.57
73	65.72	-0.04	53.81	-0.39	29.35	-0.29
78	70.18	0.64	55.25	-0.13	31.04	0.26
80	67.00	0.15	56.00	0.00	30.00	-0.08
111	64.00	-0.30	66.00	1.78	30.00	-0.08
118	56.24	-1.48	48.69	-1.31	26.92	-1.10
131	69.16	0.48	57.41	0.25	30.85	0.20
138	76.80	1.64	59.70	0.66	33.40	1.05
154	65.80	-0.03	60.70	0.84	30.80	0.19
162	65.36	-0.10	57.80	0.32	30.98	0.24
167	69.00	0.46	60.00	0.71	31.00	0.25
199	71.10	0.77	68.70	2.27 E	29.50	-0.24
208	64.30	-0.26	56.80	0.14	29.30	-0.31
222	67.90	0.29	59.20	0.57	32.10	0.62
234	67.16	0.18	54.73	-0.23	29.85	-0.13
238	66.40	0.06	55.60	-0.07	32.20	0.65
239					35.40	1.71
242	66.07	0.01	54.02	-0.35	29.15	-0.36
244	55.80	-1.54	54.00	-0.36	31.50	0.42
245	63.40	-0.39	52.30	-0.66	28.20	-0.67
252					29.80	-0.15
256	51.50	-2.20 E	53.20	-0.50	30.10	-0.05
271	61.62	-0.66	53.72	-0.41	27.37	-0.95
298	61.00	-0.76	53.00	-0.54	29.50	-0.24
302	83.33	2.63 E	86.11	5.38 BE	43.69	4.45 BE
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Method	ISO 5725-2		ISO 5725-2		ISO 5725-2	

Laboratory	n-Decane	Z score	n-Heptane	Z score	Toluene	Z score
Assessment	|Z|<=2.00		|Z|<=2.00		|Z|<=2.00	
No. of laboratories that submitted results	26		27		28	
Mean	65.99		56.00		30.24	
Reproducibility s.d.	6.66		6.73		1.82	
Rel. reproducibility s.d.	10.09 %		12.02 %		6.00 %	
Reference value	66.60		57.40		32.10	
Target s.d.	6.60		5.60		3.02	
Rel. target s.d.	10.00 %		10.00 %		10.00 %	
Lower limit of tolerance	52.79		44.80		24.19	
Upper limit of tolerance	79.18		67.21		36.29	
Type B outliers			1		1	
Type E outliers	2		4		1	
No. of laboratories after elimination of outliers type A-D and F (without laboratories that only gave states but no measured values)	26		26		27	

Summary of laboratory test results

Sample 3

Laboratory	1,2,3-Trimethylbenzene	Z score	Cumene	Z score	Cyclohexane	Z score	Ethylacetate	Z score	m-Xylene	Z score
Unit	mg/m³		mg/m³		mg/m³		mg/m³		mg/m³	
4	70.40	0.50	65.60	1.15	53.10	0.12	46.00	-2.99 E	97.20	0.48
5	73.09	0.77	57.24	-0.27	52.72	0.05	65.23	-0.06	92.16	-0.06
55	53.80	-1.19	50.40	-1.43	48.90	-0.68			79.40	-1.44
68					38.38	-2.69 E	39.75	-3.94 FE		
72	57.37	-0.83	55.81	-0.51	47.09	-1.03	57.38	-1.26	90.16	-0.28
73	61.03	-0.46	57.28	-0.26	50.31	-0.41	63.14	-0.38	93.10	0.04
78	72.90	0.75	64.17	0.91	52.38	-0.02	67.74	0.32	101.13	0.91
80	66.00	0.05	59.00	0.03	52.00	-0.09	65.00	-0.09	96.00	0.35
111	75.00	0.96	60.00	0.20	63.00	2.00 E	77.00	1.73	97.00	0.46
118	60.21	-0.54	48.96	-1.68	46.49	-1.14			81.39	-1.22
131	69.59	0.41	61.32	0.42	53.60	0.21	68.91	0.50	97.28	0.49
138	62.90	-0.27	61.60	0.47	59.70	1.38	70.30	0.71	100.00	0.79
154	52.20	-1.36	47.80	-1.87	57.80	1.01	61.10	-0.69	73.60	-2.06 E
162	74.16	0.88	66.61	1.32	53.63	0.22			108.89	1.74
167	72.00	0.66	57.00	-0.31	53.00	0.10	87.00	3.26 E	95.00	0.25
199	63.30	-0.23	63.40	0.78					92.40	-0.03
208	67.50	0.20	62.40	0.61	52.10	-0.07	66.00	0.06	90.60	-0.23
222	75.80	1.05	58.90	0.01	55.20	0.52	64.90	-0.11	96.20	0.38
234	65.66	0.01	58.08	-0.13	53.03	0.10	65.66	0.01	95.96	0.35
238	64.30	-0.12	61.60	0.47	57.40	0.94	56.90	-1.33	101.40	0.94
239			40.10	-3.18 BE	47.20	-1.01			75.80	-1.82
242	61.97	-0.36	56.44	-0.40	50.33	-0.41	62.59	-0.46	92.21	-0.05
244	60.40	-0.52	58.50	-0.05	52.80	0.06	64.70	-0.14	91.60	-0.12
245	63.70	-0.19	56.80	-0.34	49.70	-0.53	64.00	-0.25	89.60	-0.34
252							65.20	-0.06		
256	65.80	0.03	57.60	-0.21	50.50	-0.38	58.90	-1.02	91.00	-0.19
271	57.98	-0.77	59.34	0.09	46.03	-1.23	62.04	-0.55	88.31	-0.48
298	71.00	0.56	55.80	-0.51	51.90	-0.11	67.80	0.33	90.20	-0.27

Laboratory	1,2,3-Trimethylbenzene	Z score	Cumene	Z score	Cyclohexane	Z score	Ethylacetate	Z score	m-Xylene	Z score
302	182.97	11.95 BE	67.68	1.51	68.69	3.09 E	81.79	2.46 E	105.81	1.41
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Method	ISO 5725-2		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		|Z|<=2.00	
No. of laboratories that submitted results	26		27		27		24		27	
Mean	65.52		58.82		52.48		65.62		92.72	
Reproducibility s.d.	6.58		4.89		5.74		8.31		8.18	
Rel. reproducibility s.d.	10.05 %		8.32 %		10.94 %		12.66 %		8.82 %	
Reference value	74.80		59.20		54.20		71.40		99.10	
Target s.d.	9.83		5.88		5.25		6.56		9.27	
Rel. target s.d.	15.00 %		10.00 %		10.00 %		10.00 %		10.00 %	
Lower limit of tolerance	45.87		47.06		41.98		52.50		74.17	
Upper limit of tolerance	85.18		70.58		62.98		78.75		111.26	
Type B outliers	1		1							
Type E outliers	1		1		3		4		1	
Type F outliers							1			
No. of laboratories after elimination of outliers type A-D and F (without laboratories that only gave states but no measured values)	25		26		27		23		27	

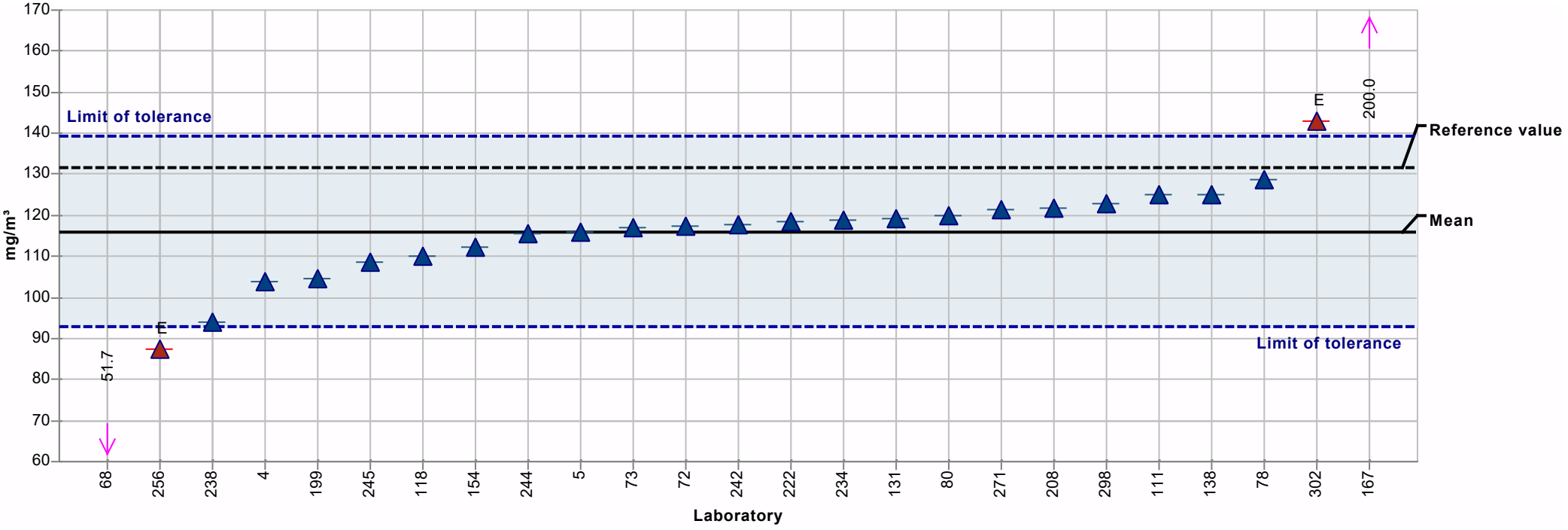
Explanation of outlier types	
A: Single outlier	Grubbs
B: Differing laboratory mean	Grubbs
C: Excessive laboratory s.d.	Cochran
D: Excluded manually	
E: mean outside tolerance limits	
F: |Z-Score|>3.50	

Laboratory	n-Decane	Z score	n-Heptane	Z score	Toluene	Z score
Unit	mg/m³		mg/m³		mg/m³	
4	46.50	1.23	55.40	2.53 E	55.80	0.79
5	40.27	-0.27	42.60	-0.36	51.62	-0.02
55	35.50	-1.42	38.20	-1.36	48.60	-0.60
68			25.12	-4.32 BE		
72	38.42	-0.72	39.19	-1.13	49.91	-0.35
73	41.45	0.01	41.42	-0.63	51.25	-0.09
78	44.04	0.64	43.29	-0.21	54.86	0.61
80	42.00	0.15	43.00	-0.27	53.00	0.25
111	44.00	0.63	52.00	1.77	52.00	0.05
118	35.13	-1.51	37.30	-1.56	45.68	-1.17
131	43.19	0.43	43.70	-0.11	53.47	0.34
138	47.90	1.57	46.80	0.59	58.10	1.23
154	41.30	-0.02	47.10	0.66	48.20	-0.68
162	45.55	1.00	44.14	-0.01	58.51	1.31
167	42.00	0.15	45.00	0.18	53.00	0.25
199	41.70	0.07	54.00	2.22 E	48.20	-0.68
208	39.70	-0.41	42.80	-0.32	49.70	-0.39
222	42.50	0.27	45.80	0.36	52.50	0.15
234	42.93	0.37	42.93	-0.29	53.03	0.25
238	47.00	1.35	47.50	0.75	81.40	5.74 BE
239					41.90	-1.90
242	42.71	0.32	41.35	-0.64	50.79	-0.18
244	33.70	-1.86	41.30	-0.66	52.60	0.17
245	39.80	-0.38	40.50	-0.84	49.20	-0.49
252					52.10	0.07
256	34.10	-1.76	40.70	-0.79	51.80	0.02
271	37.65	-0.90	38.40	-1.31	49.05	-0.52
298	40.70	-0.17	41.20	-0.68	51.40	-0.06
302	46.46	1.22	53.54	2.11 E	60.10	1.62
–	–	– –	–	– –	–	– –
Method	ISO 5725-2		ISO 5725-2		ISO 5725-2	

Laboratory	n-Decane	Z score	n-Heptane	Z score	Toluene	Z score
Assessment	|Z|<=2.00		|Z|<=2.00		|Z|<=2.00	
No. of laboratories that submitted results	26		27		28	
Mean	41.39		44.20		51.72	
Reproducibility s.d.	3.91		4.94		3.84	
Rel. reproducibility s.d.	9.45 %		11.17 %		7.42 %	
Reference value	42.20		45.30		55.80	
Target s.d.	4.14		4.42		5.17	
Rel. target s.d.	10.00 %		10.00 %		10.00 %	
Lower limit of tolerance	33.11		35.36		41.37	
Upper limit of tolerance	49.67		53.04		62.06	
Type B outliers			1		1	
Type E outliers			4		1	
No. of laboratories after elimination of outliers type A-D and F (without laboratories that only gave states but no measured values)	26		26		27	

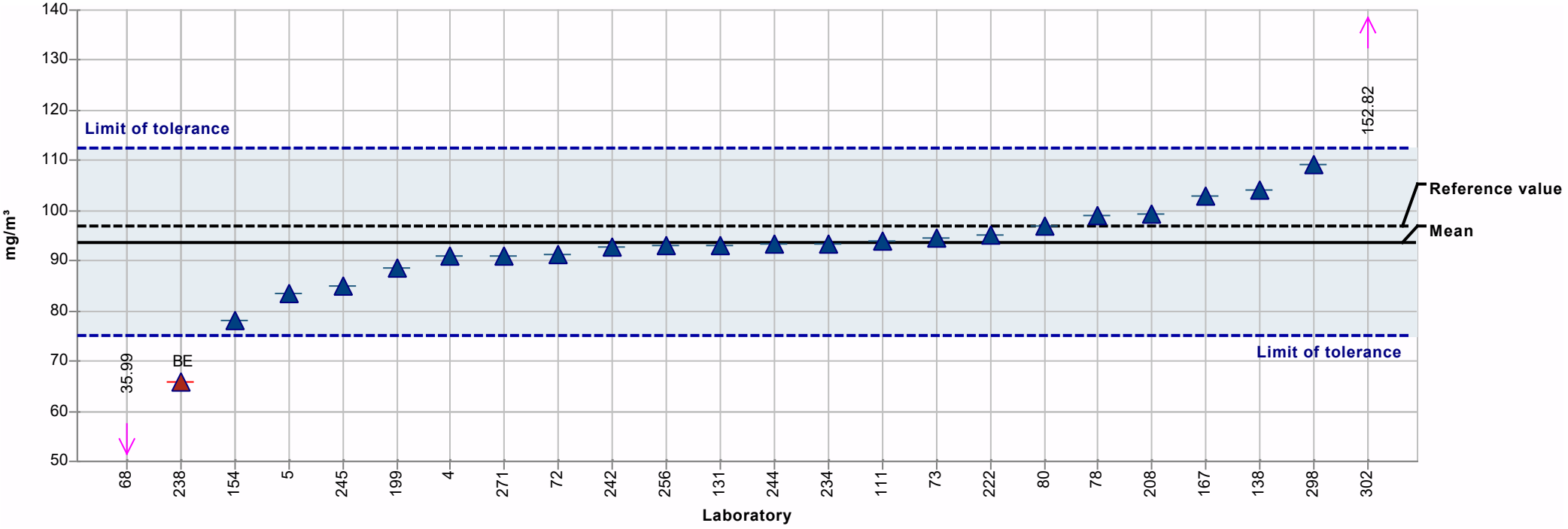
Summary results

Sample:	**1**	**Mean:**	**116.0 mg/m³**
Measurand:	**1-Butanol**	**Reproducibility s.d.:**	**11.4 mg/m³**
Method:	**ISO 5725-2**	**Rel. reproducibility s.d.:**	**9.85%**
Rel. target s.d.:	**10.00%**	**Reference value:**	**131.6 mg/m³**
Number of laboratories in calculation + outliers:	**25**	**Range of tolerance:**	**92.8 - 139.2 mg/m³ (|Z-Score| <= 2.00)**
No. of outlier values:	**2**		



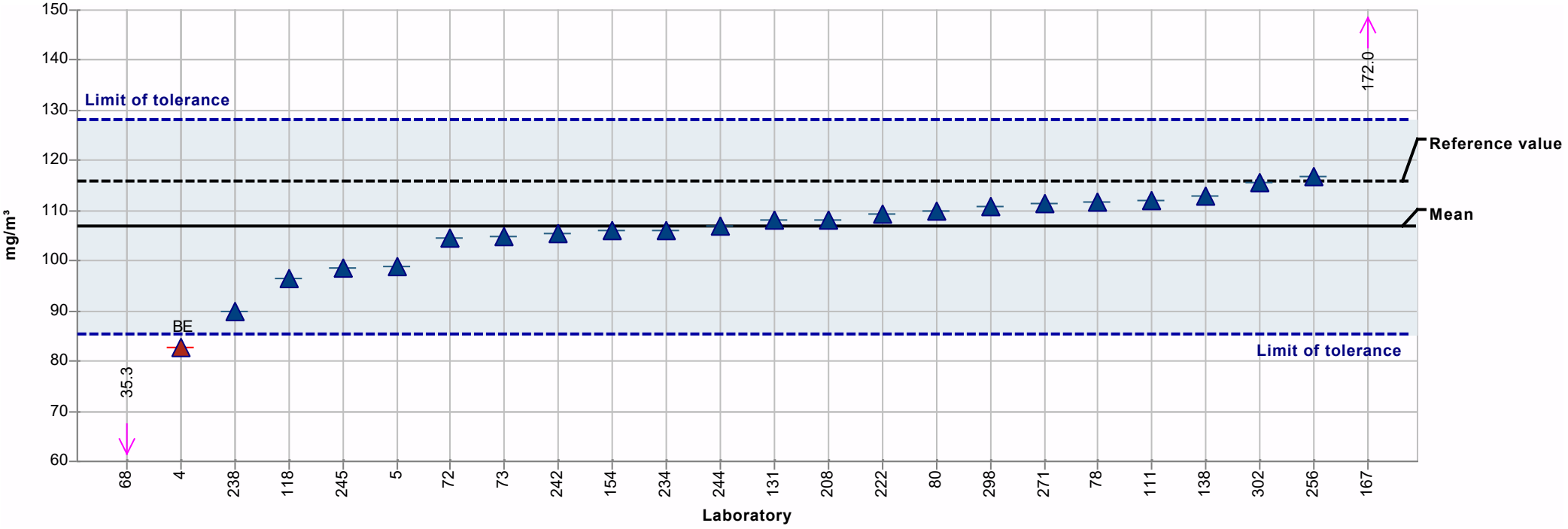
Summary results

Sample:	**1**	**Mean:**	**93.79 mg/m³**
Measurand:	**1-Methoxy-2-Propanol**	**Reproducibility s.d.:**	**7.00 mg/m³**
Method:	**ISO 5725-2**	**Rel. reproducibility s.d.:**	**7.46%**
Rel. target s.d.:	**10.00%**	**Reference value:**	**96.80 mg/m³**
Number of laboratories in calculation + outliers:	**24**	**Range of tolerance:**	**75.03 - 112.55 mg/m³ (|Z-Score| <= 2.00)**
No. of outlier values:	**3**		



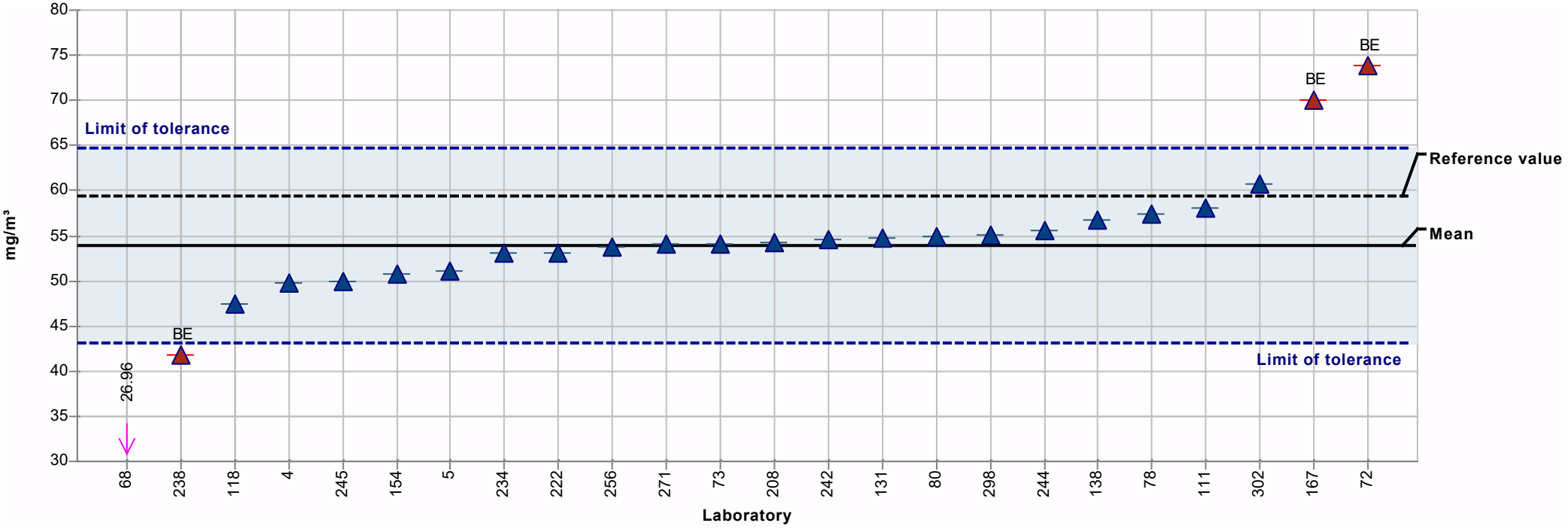
Summary results

Sample:	**1**	**Mean:**	**106.9 mg/m³**
Measurand:	**1-Propanol**	**Reproducibility s.d.:**	**6.6 mg/m³**
Method:	**ISO 5725-2**	**Rel. reproducibility s.d.:**	**6.16%**
Rel. target s.d.:	**10.00%**	**Reference value:**	**116.0 mg/m³**
Number of laboratories in calculation + outliers:	**24**	**Range of tolerance:**	**85.5 - 128.3 mg/m³ (|Z-Score| <= 2.00)**
No. of outlier values:	**3**		



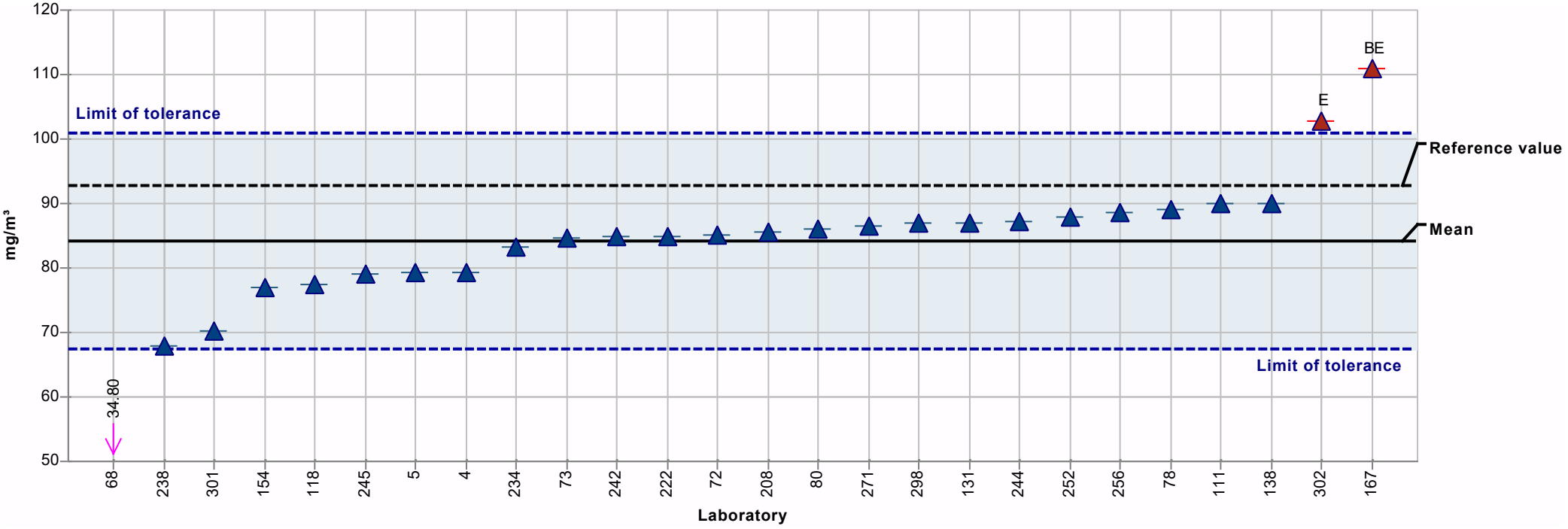
Summary results

Sample:	**1**	**Mean:**	**53.97 mg/m³**
Measurand:	**2-Butanol**	**Reproducibility s.d.:**	**3.12 mg/m³**
Method:	**ISO 5725-2**	**Rel. reproducibility s.d.:**	**5.77%**
Rel. target s.d.:	**10.00%**	**Reference value:**	**59.40 mg/m³**
Number of laboratories in calculation + outliers:	**24**	**Range of tolerance:**	**43.17 - 64.76 mg/m³ (|Z-Score| <= 2.00)**
No. of outlier values:	**4**		



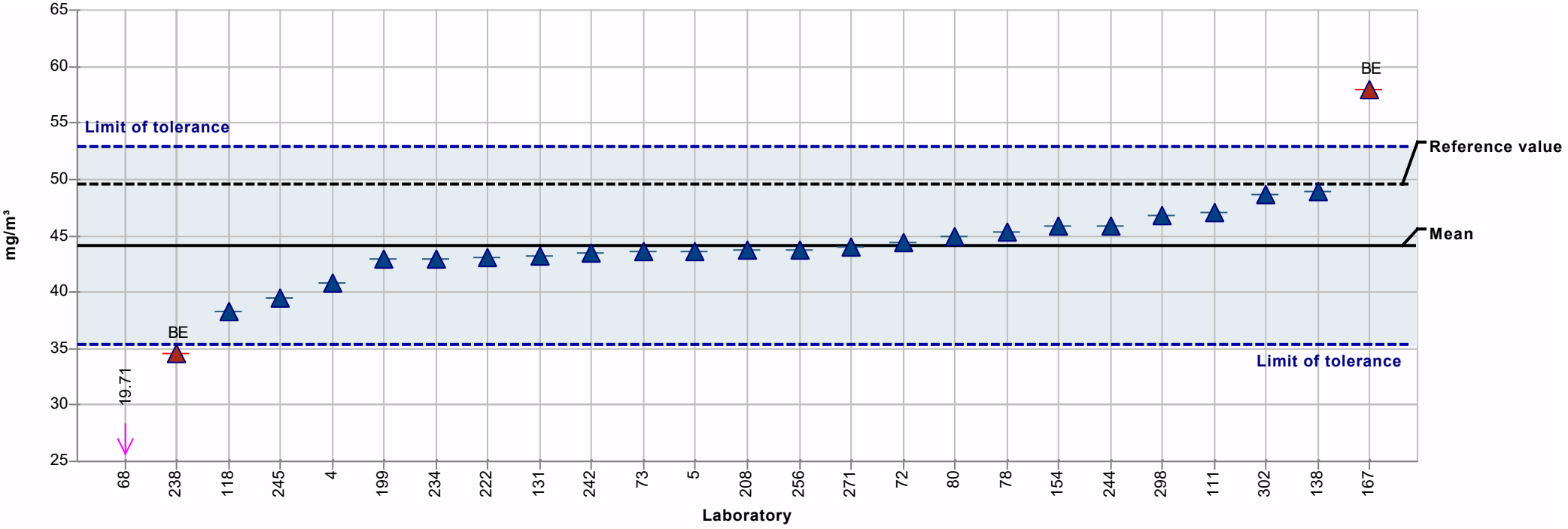
Summary results

Sample:	**1**	**Mean:**	**84.20 mg/m³**
Measurand:	**2-Propanol**	**Reproducibility s.d.:**	**7.06 mg/m³**
Method:	**ISO 5725-2**	**Rel. reproducibility s.d.:**	**8.38%**
Rel. target s.d.:	**10.00%**	**Reference value:**	**92.70 mg/m³**
Number of laboratories in calculation + outliers:	**26**	**Range of tolerance:**	**67.36 - 101.04 mg/m³ (|Z-Score| <= 2.00)**
No. of outlier values:	**2**		



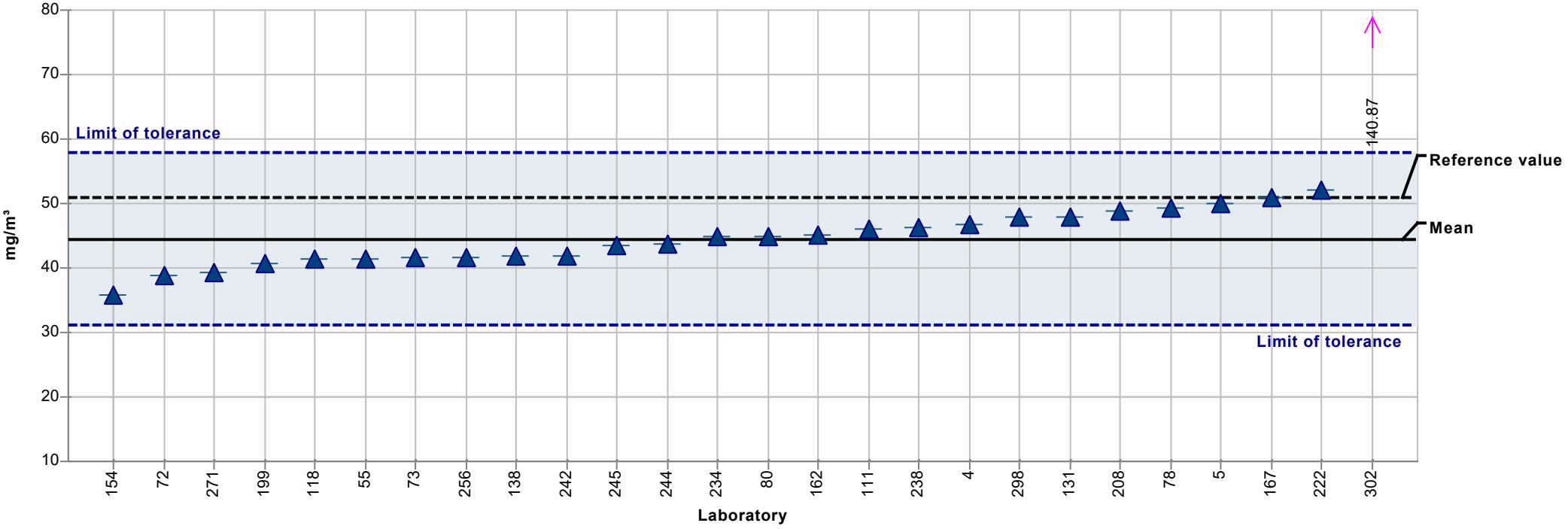
Summary results

Sample:	**1**	**Mean:**	**44.13 mg/m³**
Measurand:	**i-Butanol**	**Reproducibility s.d.:**	**2.59 mg/m³**
Method:	**ISO 5725-2**	**Rel. reproducibility s.d.:**	**5.87%**
Rel. target s.d.:	**10.00%**	**Reference value:**	**49.60 mg/m³**
Number of laboratories in calculation + outliers:	**25**	**Range of tolerance:**	**35.30 - 52.96 mg/m³ (|Z-Score| <= 2.00)**
No. of outlier values:	**3**		



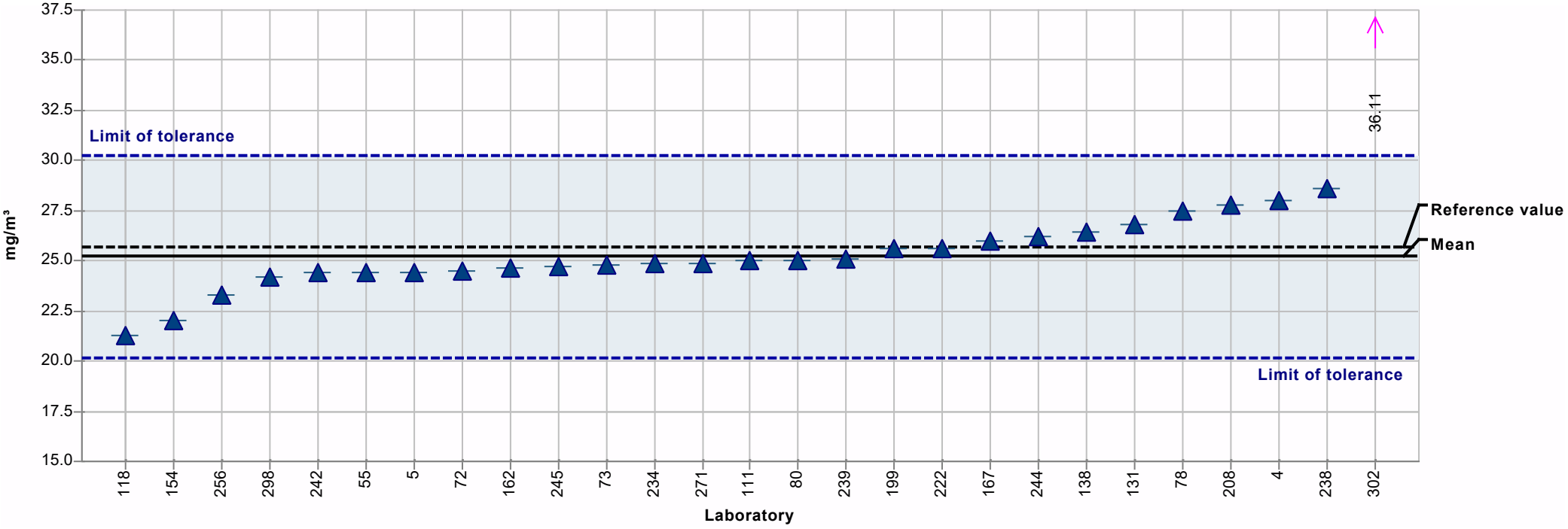
Summary results

Sample:	**2**	**Mean:**	**44.50 mg/m³**
Measurand:	**1,2,3-Trimethylbenzene**	**Reproducibility s.d.:**	**4.14 mg/m³**
Method:	**ISO 5725-2**	**Rel. reproducibility s.d.:**	**9.30%**
Rel. target s.d.:	**15.00%**	**Reference value:**	**50.90 mg/m³**
Number of laboratories in calculation + outliers:	**26**	**Range of tolerance:**	**31.15 - 57.85 mg/m³ (|Z-Score| <= 2.00)**
No. of outlier values:	**1**		



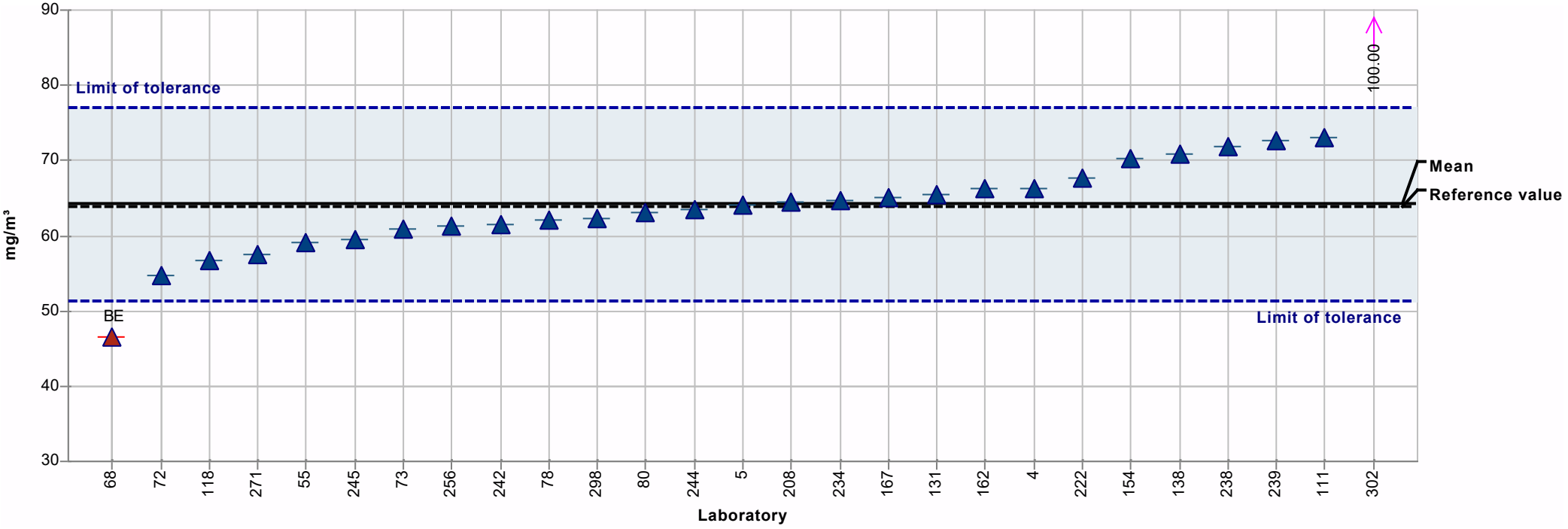
Summary results

Sample:	**2**	**Mean:**	**25.23 mg/m³**
Measurand:	**Cumene**	**Reproducibility s.d.:**	**1.69 mg/m³**
Method:	**ISO 5725-2**	**Rel. reproducibility s.d.:**	**6.68%**
Rel. target s.d.:	**10.00%**	**Reference value:**	**25.70 mg/m³**
Number of laboratories in calculation + outliers:	**27**	**Range of tolerance:**	**20.18 - 30.28 mg/m³ (|Z-Score| <= 2.00)**
No. of outlier values:	**1**		



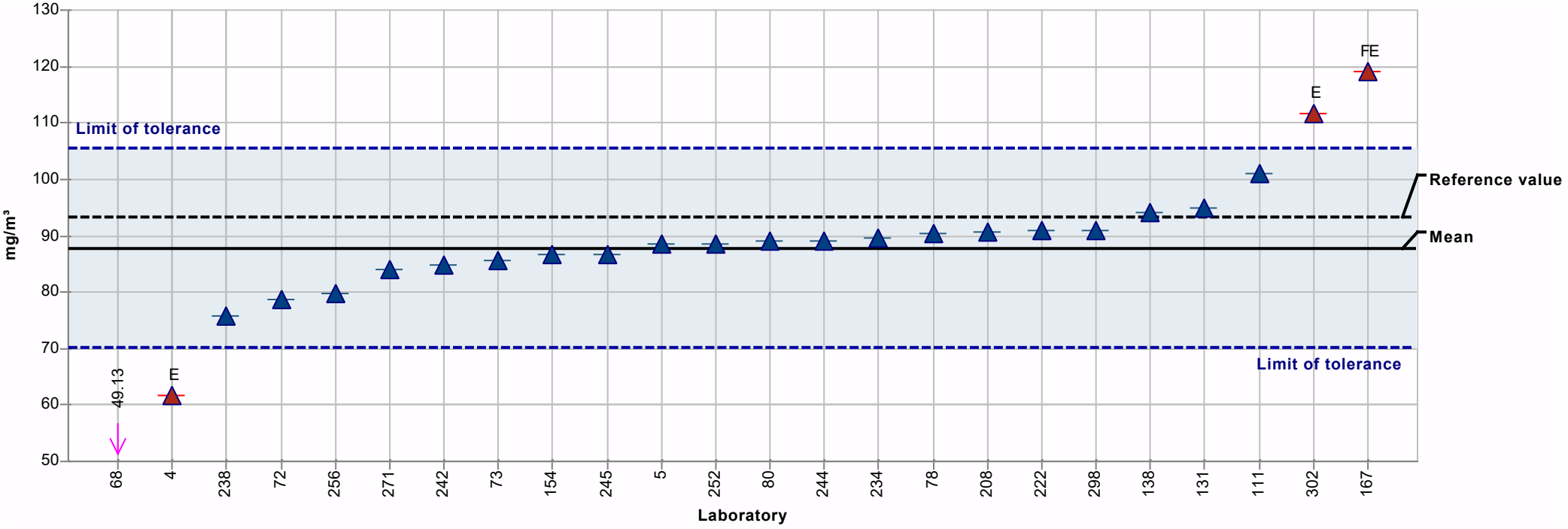
Summary results

Sample:	**2**	**Mean:**	**64.19 mg/m³**
Measurand:	**Cyclohexane**	**Reproducibility s.d.:**	**4.94 mg/m³**
Method:	**ISO 5725-2**	**Rel. reproducibility s.d.:**	**7.69%**
Rel. target s.d.:	**10.00%**	**Reference value:**	**63.80 mg/m³**
Number of laboratories in calculation + outliers:	**27**	**Range of tolerance:**	**51.35 - 77.03 mg/m³ (|Z-Score| <= 2.00)**
No. of outlier values:	**2**		



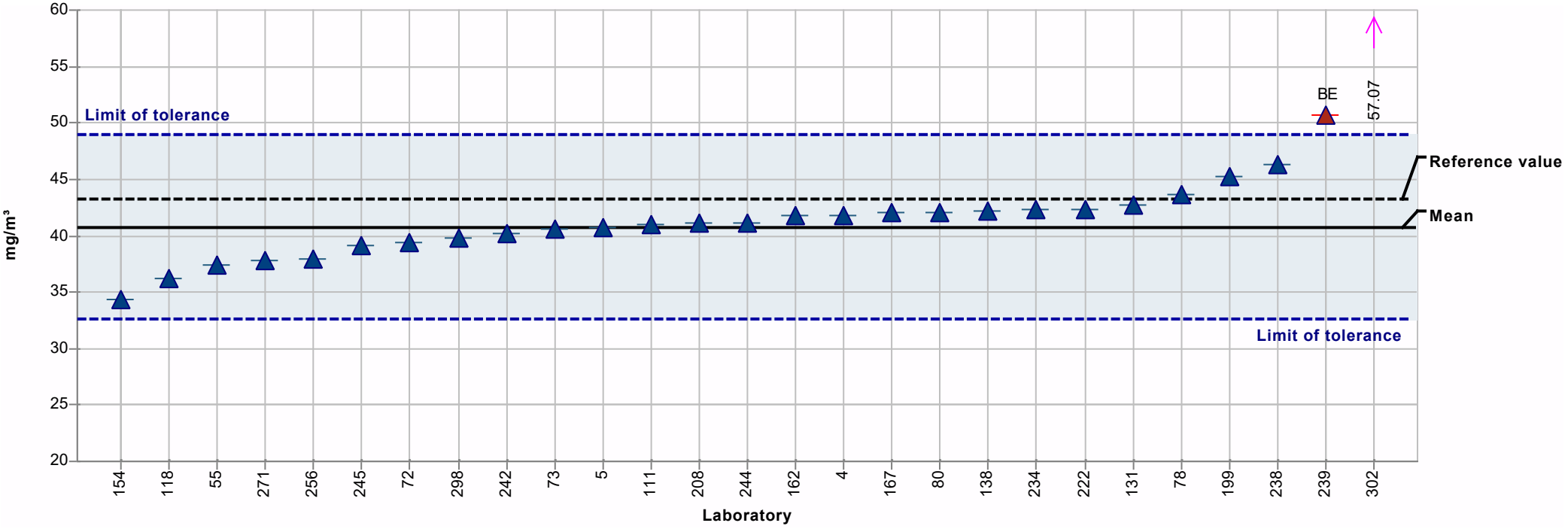
Summary results

Sample:	**2**	**Mean:**	**87.87 mg/m³**
Measurand:	**Ethylacetate**	**Reproducibility s.d.:**	**9.46 mg/m³**
Method:	**ISO 5725-2**	**Rel. reproducibility s.d.:**	**10.76%**
Rel. target s.d.:	**10.00%**	**Reference value:**	**93.40 mg/m³**
Number of laboratories in calculation + outliers:	**24**	**Range of tolerance:**	**70.29 - 105.44 mg/m³ (|Z-Score| <= 2.00)**
No. of outlier values:	**2**		



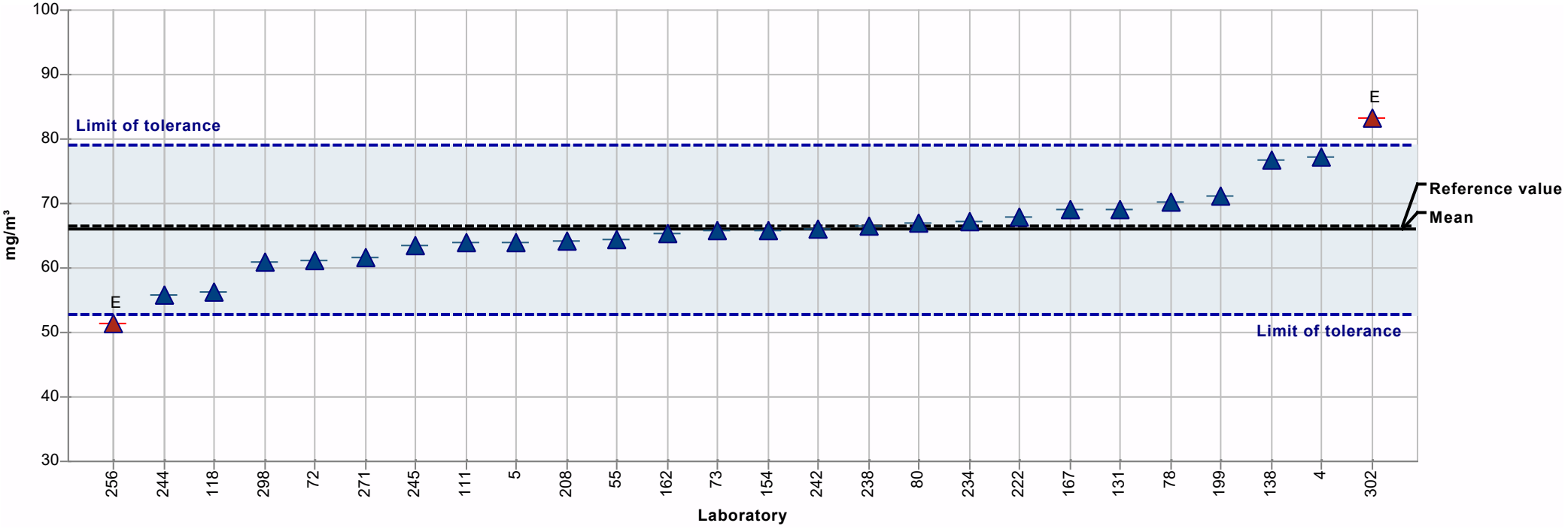
Summary results

Sample:	**2**	**Mean:**	**40.76 mg/m³**
Measurand:	**m-Xylene**	**Reproducibility s.d.:**	**2.67 mg/m³**
Method:	**ISO 5725-2**	**Rel. reproducibility s.d.:**	**6.56%**
Rel. target s.d.:	**10.00%**	**Reference value:**	**43.20 mg/m³**
Number of laboratories in calculation + outliers:	**27**	**Range of tolerance:**	**32.61 - 48.91 mg/m³ (|Z-Score| <= 2.00)**
No. of outlier values:	**2**		



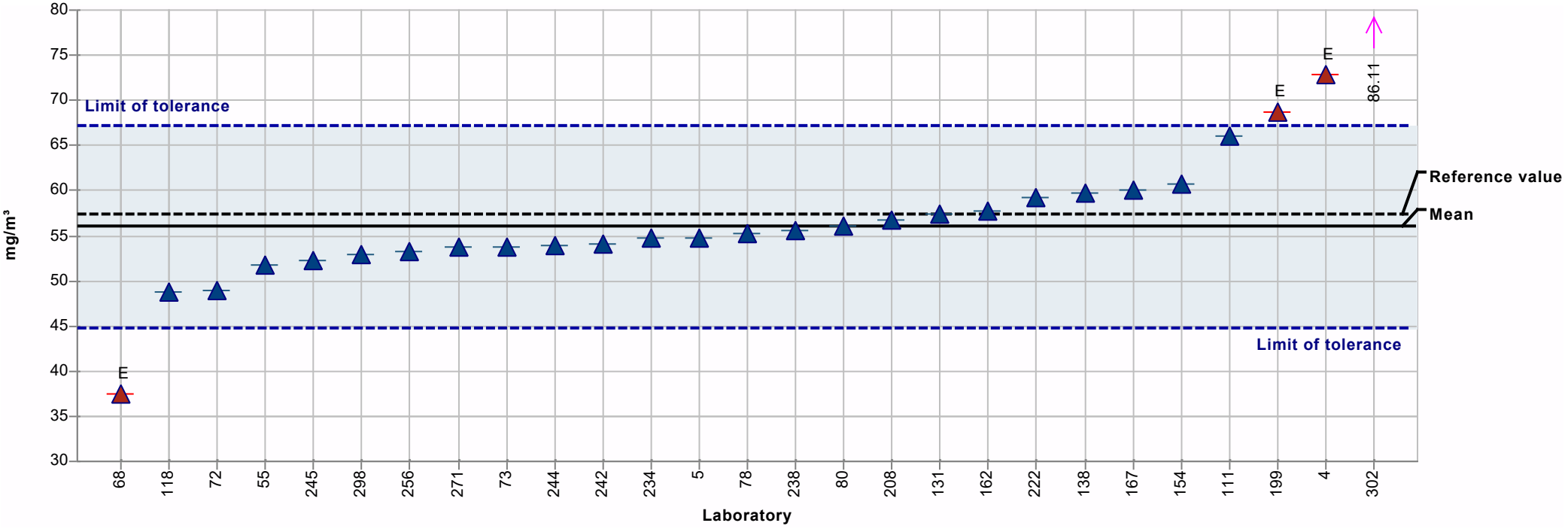
Summary results

Sample:	**2**	**Mean:**	**65.99 mg/m³**
Measurand:	**n-Decane**	**Reproducibility s.d.:**	**6.66 mg/m³**
Method:	**ISO 5725-2**	**Rel. reproducibility s.d.:**	**10.09%**
Rel. target s.d.:	**10.00%**	**Reference value:**	**66.60 mg/m³**
Number of laboratories in calculation + outliers:	**26**	**Range of tolerance:**	**52.79 - 79.18 mg/m³ (|Z-Score| <= 2.00)**
No. of outlier values:	**0**		



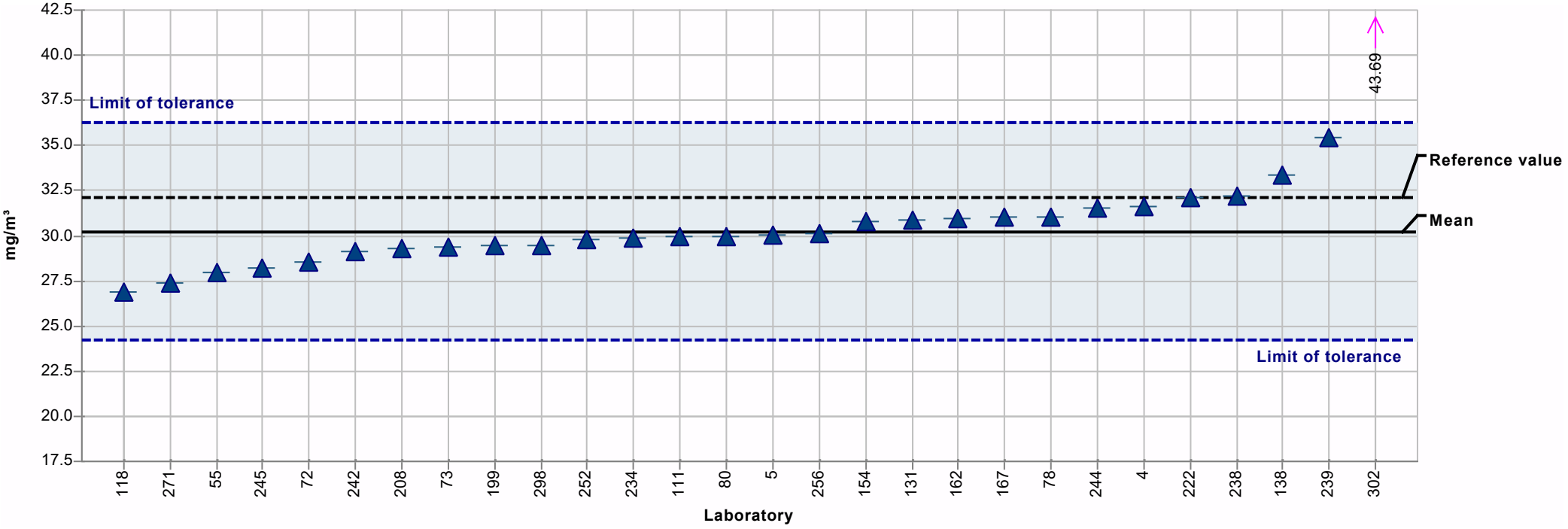
Summary results

Sample:	**2**	**Mean:**	**56.00 mg/m³**
Measurand:	**n-Heptane**	**Reproducibility s.d.:**	**6.73 mg/m³**
Method:	**ISO 5725-2**	**Rel. reproducibility s.d.:**	**12.02%**
Rel. target s.d.:	**10.00%**	**Reference value:**	**57.40 mg/m³**
Number of laboratories in calculation + outliers:	**27**	**Range of tolerance:**	**44.80 - 67.21 mg/m³ (|Z-Score| <= 2.00)**
No. of outlier values:	**1**		



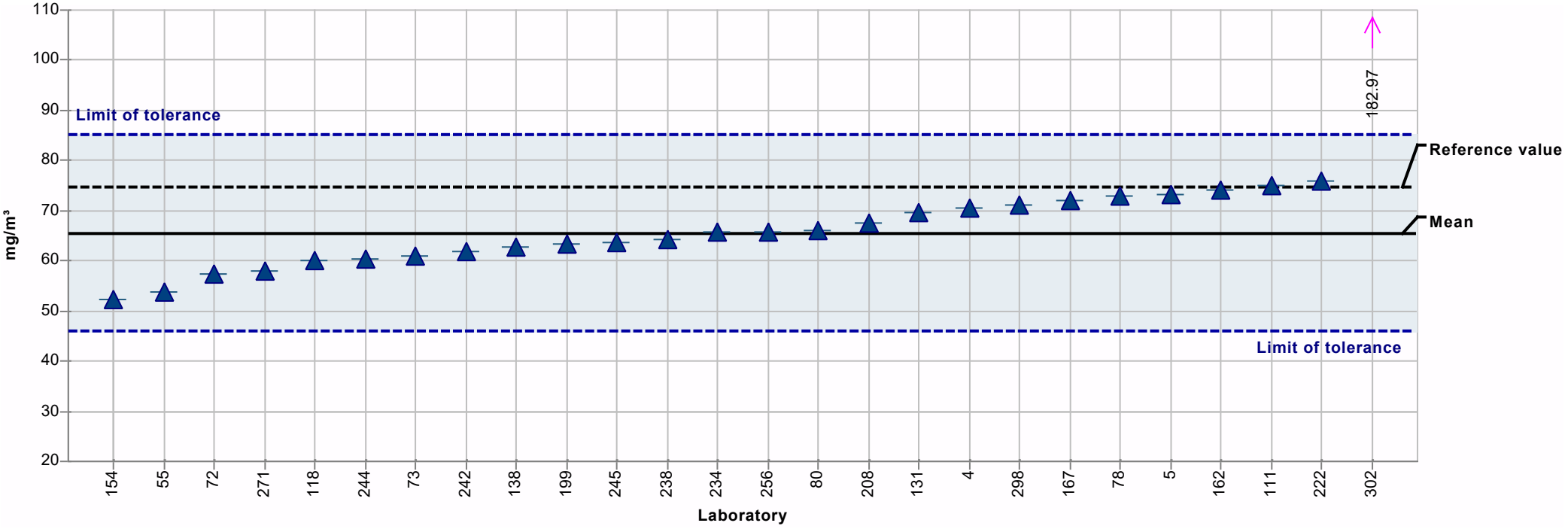
Summary results

Sample:	**2**	**Mean:**	**30.24 mg/m³**
Measurand:	**Toluene**	**Reproducibility s.d.:**	**1.82 mg/m³**
Method:	**ISO 5725-2**	**Rel. reproducibility s.d.:**	**6.00%**
Rel. target s.d.:	**10.00%**	**Reference value:**	**32.10 mg/m³**
Number of laboratories in calculation + outliers:	**28**	**Range of tolerance:**	**24.19 - 36.29 mg/m³ (|Z-Score| <= 2.00)**
No. of outlier values:	**1**		



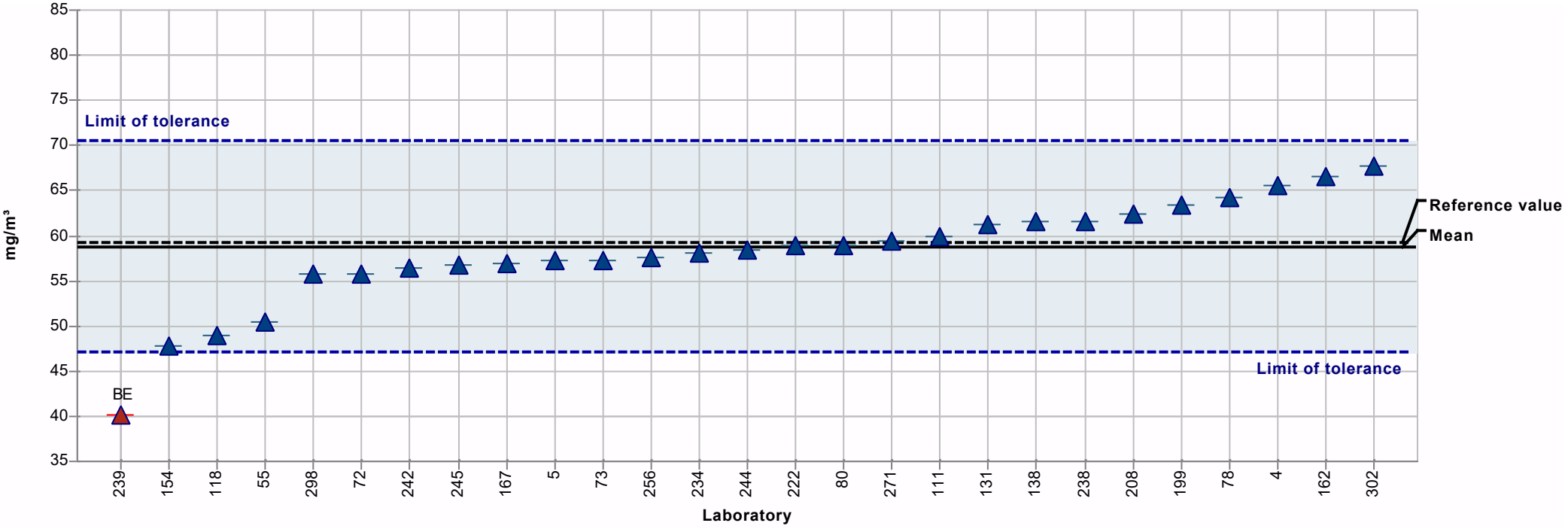
Summary results

Sample:	**3**	**Mean:**	**65.52 mg/m³**
Measurand:	**1,2,3-Trimethylbenzene**	**Reproducibility s.d.:**	**6.58 mg/m³**
Method:	**ISO 5725-2**	**Rel. reproducibility s.d.:**	**10.05%**
Rel. target s.d.:	**15.00%**	**Reference value:**	**74.80 mg/m³**
Number of laboratories in calculation + outliers:	**26**	**Range of tolerance:**	**45.87 - 85.18 mg/m³ (|Z-Score| <= 2.00)**
No. of outlier values:	**1**		



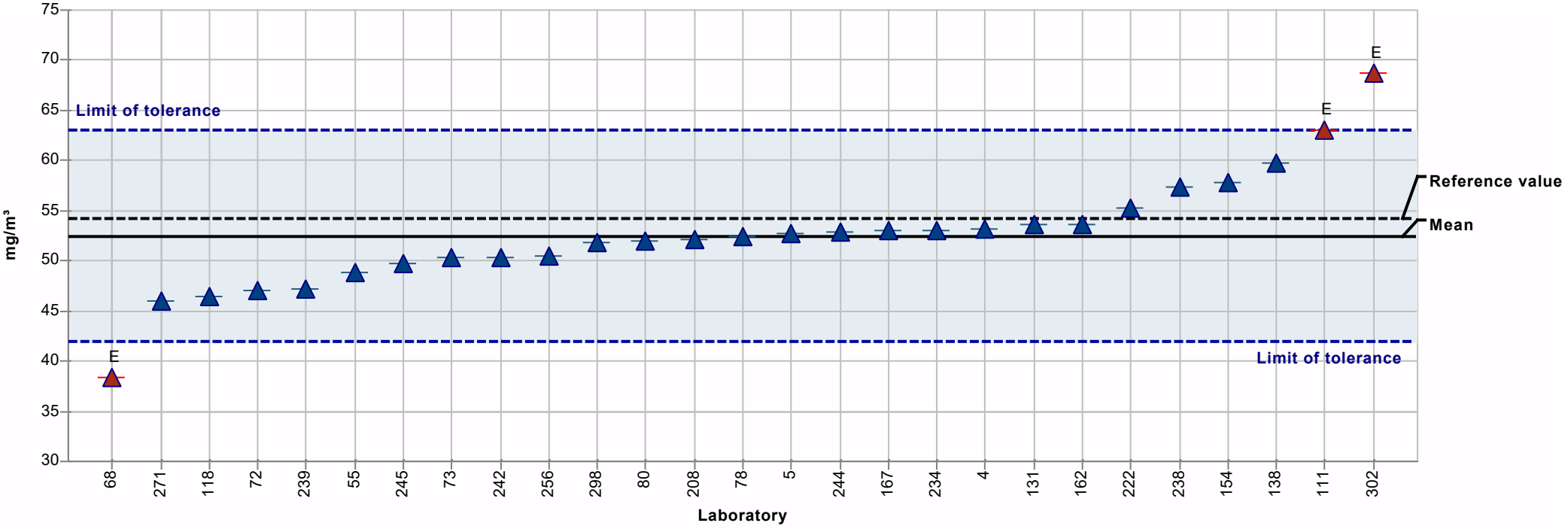
Summary results

Sample:	**3**	**Mean:**	**58.82 mg/m³**
Measurand:	**Cumene**	**Reproducibility s.d.:**	**4.89 mg/m³**
Method:	**ISO 5725-2**	**Rel. reproducibility s.d.:**	**8.32%**
Rel. target s.d.:	**10.00%**	**Reference value:**	**59.20 mg/m³**
Number of laboratories in calculation + outliers:	**27**	**Range of tolerance:**	**47.06 - 70.58 mg/m³ (|Z-Score| <= 2.00)**
No. of outlier values:	**1**		



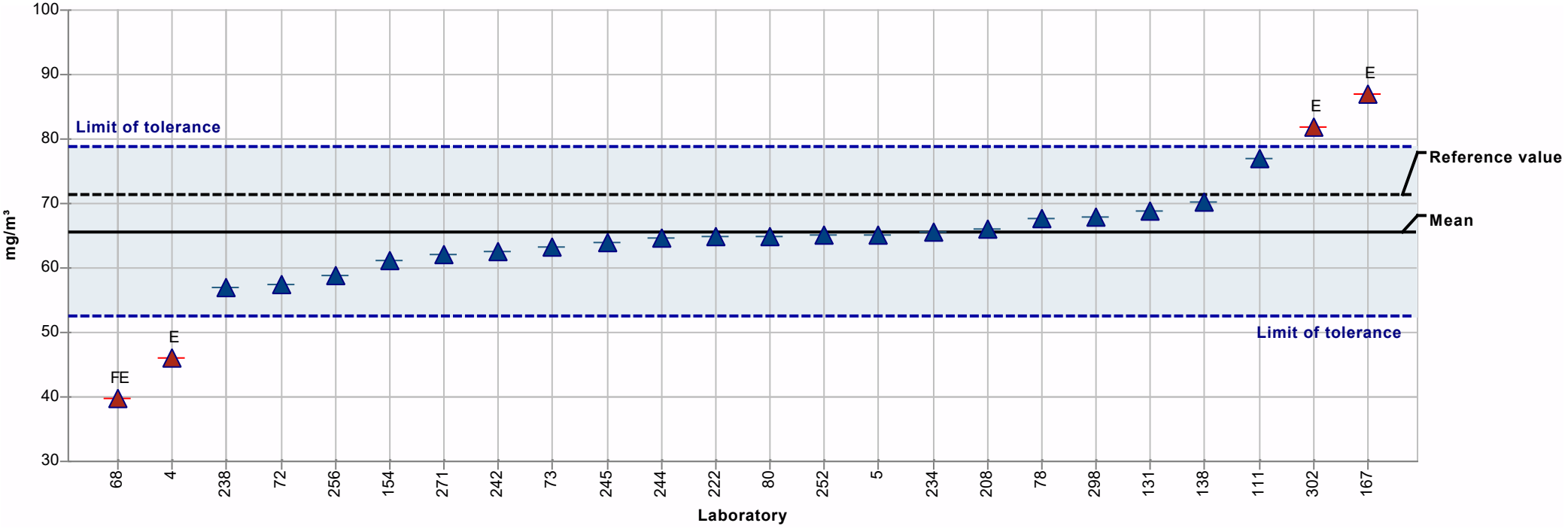
Summary results

Sample:	**3**	**Mean:**	**52.48 mg/m³**
Measurand:	**Cyclohexane**	**Reproducibility s.d.:**	**5.74 mg/m³**
Method:	**ISO 5725-2**	**Rel. reproducibility s.d.:**	**10.94%**
Rel. target s.d.:	**10.00%**	**Reference value:**	**54.20 mg/m³**
Number of laboratories in calculation + outliers:	**27**	**Range of tolerance:**	**41.98 - 62.98 mg/m³ (|Z-Score| <= 2.00)**
No. of outlier values:	**0**		



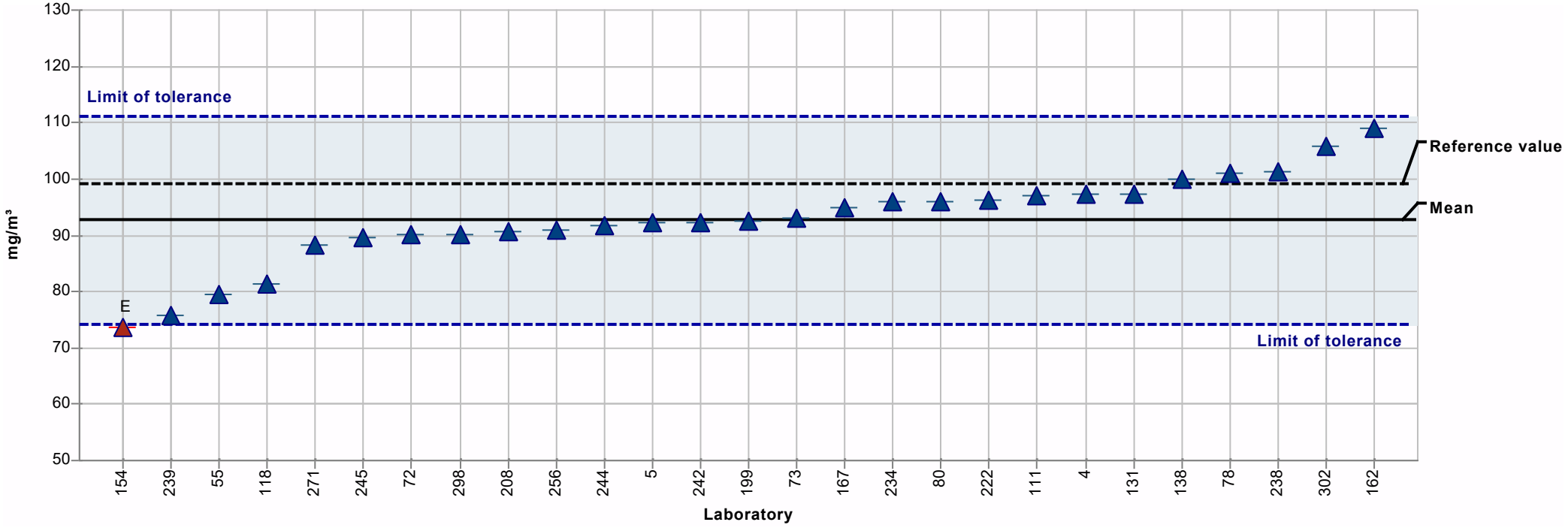
Summary results

Sample:	**3**	**Mean:**	**65.62 mg/m³**
Measurand:	**Ethylacetate**	**Reproducibility s.d.:**	**8.31 mg/m³**
Method:	**ISO 5725-2**	**Rel. reproducibility s.d.:**	**12.66%**
Rel. target s.d.:	**10.00%**	**Reference value:**	**71.40 mg/m³**
Number of laboratories in calculation + outliers:	**24**	**Range of tolerance:**	**52.50 - 78.75 mg/m³ (|Z-Score| <= 2.00)**
No. of outlier values:	**1**		



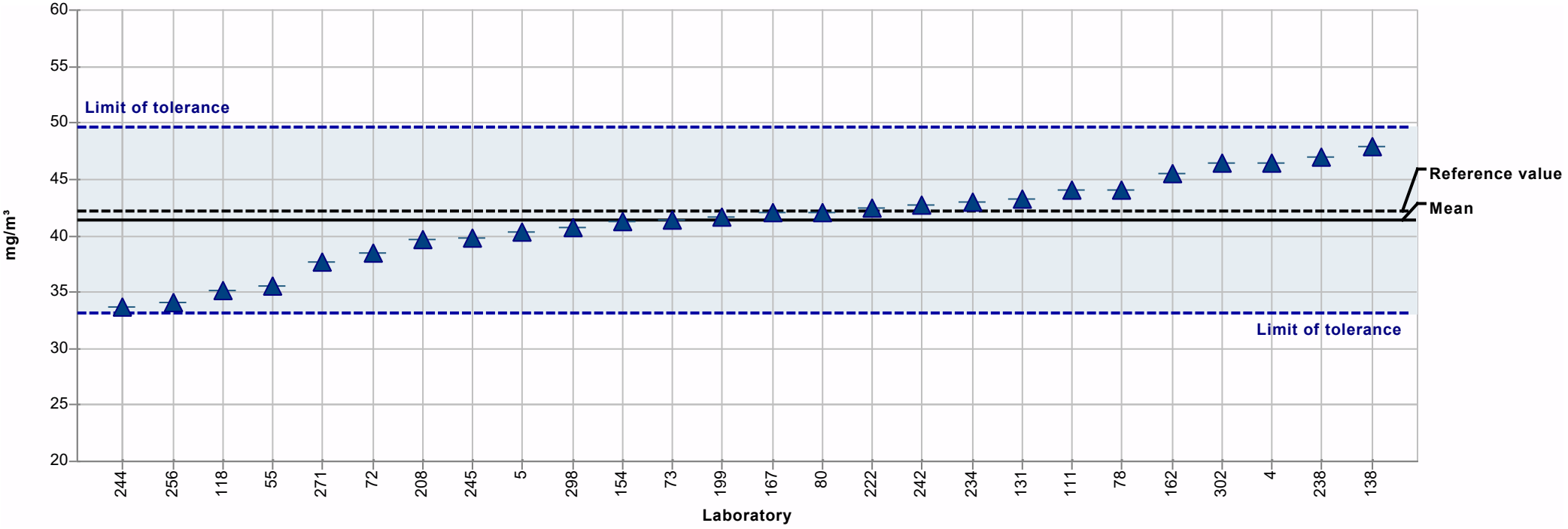
Summary results

Sample:	**3**	**Mean:**	**92.72 mg/m³**
Measurand:	**m-Xylene**	**Reproducibility s.d.:**	**8.18 mg/m³**
Method:	**ISO 5725-2**	**Rel. reproducibility s.d.:**	**8.82%**
Rel. target s.d.:	**10.00%**	**Reference value:**	**99.10 mg/m³**
Number of laboratories in calculation + outliers:	**27**	**Range of tolerance:**	**74.17 - 111.26 mg/m³ (|Z-Score| <= 2.00)**
No. of outlier values:	**0**		



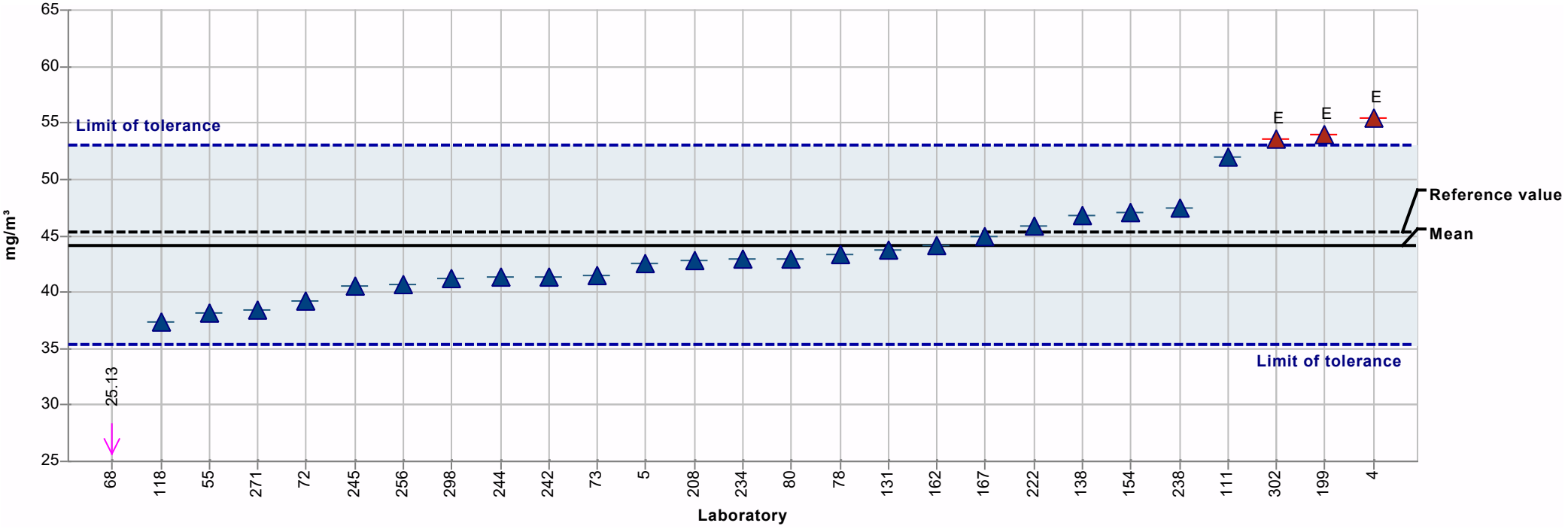
Summary results

Sample:	**3**	**Mean:**	**41.39 mg/m³**
Measurand:	**n-Decane**	**Reproducibility s.d.:**	**3.91 mg/m³**
Method:	**ISO 5725-2**	**Rel. reproducibility s.d.:**	**9.45%**
Rel. target s.d.:	**10.00%**	**Reference value:**	**42.20 mg/m³**
Number of laboratories in calculation + outliers:	**26**	**Range of tolerance:**	**33.11 - 49.67 mg/m³ (|Z-Score| <= 2.00)**
No. of outlier values:	**0**		



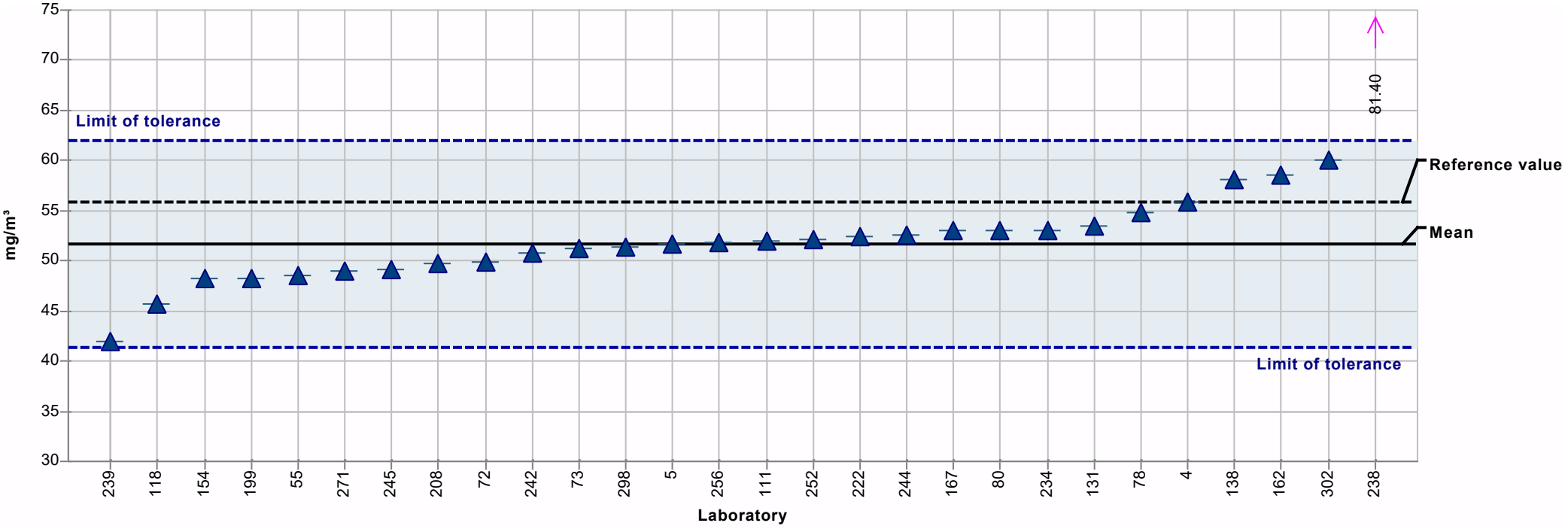
Summary results

Sample:	**3**	**Mean:**	**44.20 mg/m³**
Measurand:	**n-Heptane**	**Reproducibility s.d.:**	**4.94 mg/m³**
Method:	**ISO 5725-2**	**Rel. reproducibility s.d.:**	**11.17%**
Rel. target s.d.:	**10.00%**	**Reference value:**	**45.30 mg/m³**
Number of laboratories in calculation + outliers:	**27**	**Range of tolerance:**	**35.36 - 53.04 mg/m³ (|Z-Score| <= 2.00)**
No. of outlier values:	**1**		



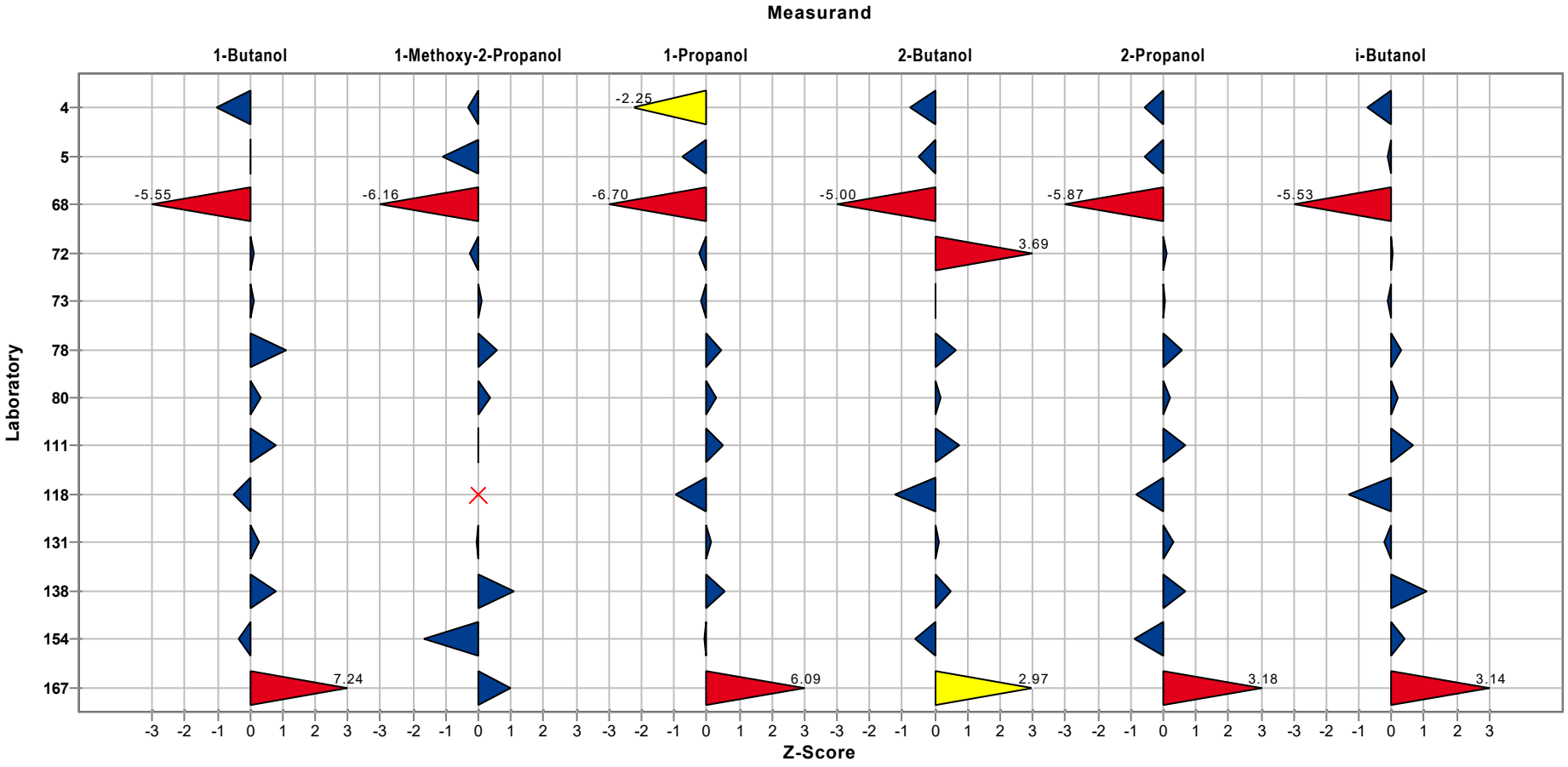
Summary results

Sample:	**3**	**Mean:**	**51.72 mg/m³**
Measurand:	**Toluene**	**Reproducibility s.d.:**	**3.84 mg/m³**
Method:	**ISO 5725-2**	**Rel. reproducibility s.d.:**	**7.42%**
Rel. target s.d.:	**10.00%**	**Reference value:**	**55.80 mg/m³**
Number of laboratories in calculation + outliers:	**28**	**Range of tolerance:**	**41.37 - 62.06 mg/m³ (|Z-Score| <= 2.00)**
No. of outlier values:	**1**		



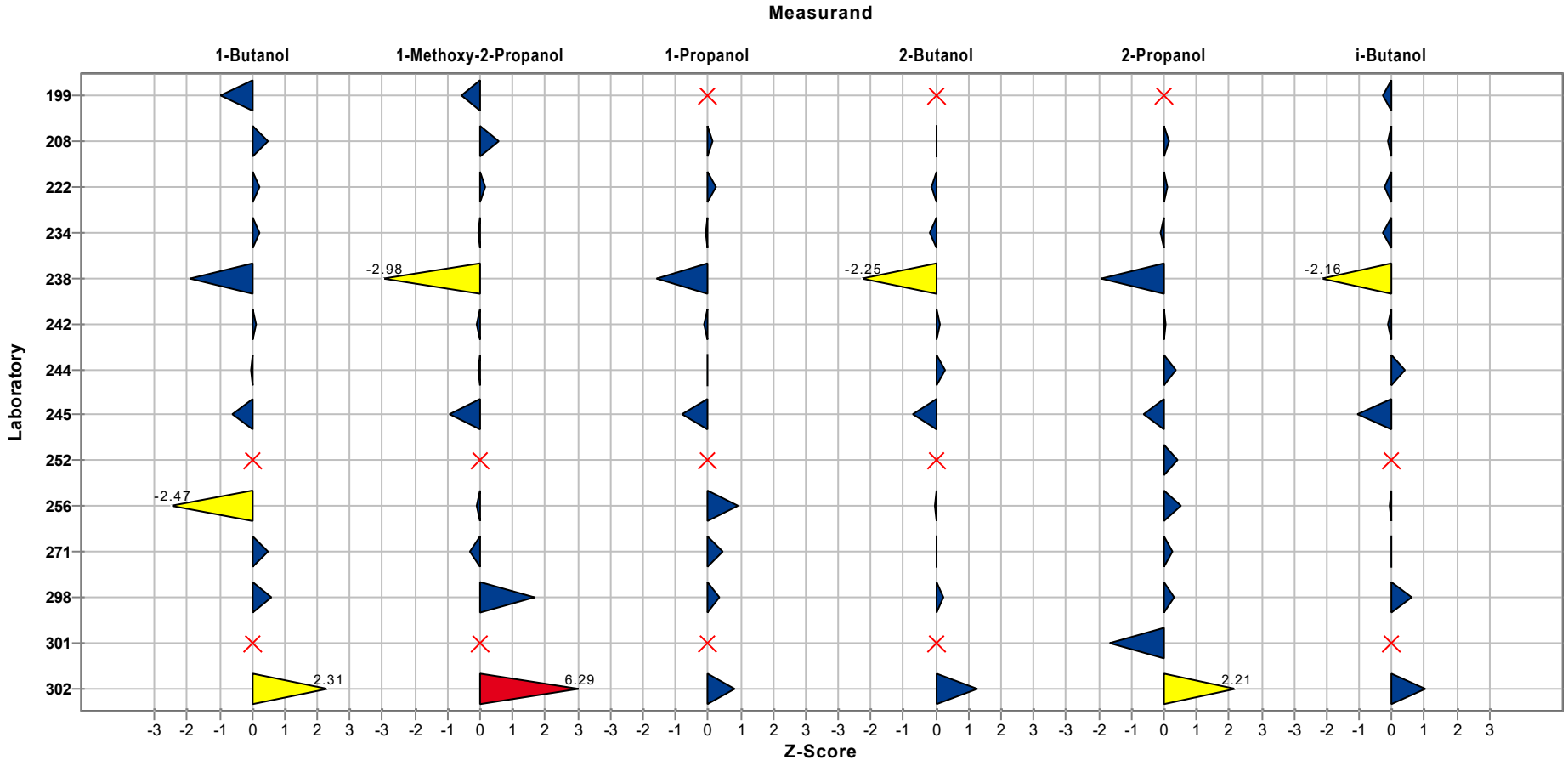
Sample chart of *Z-Scores*

Sample: 1



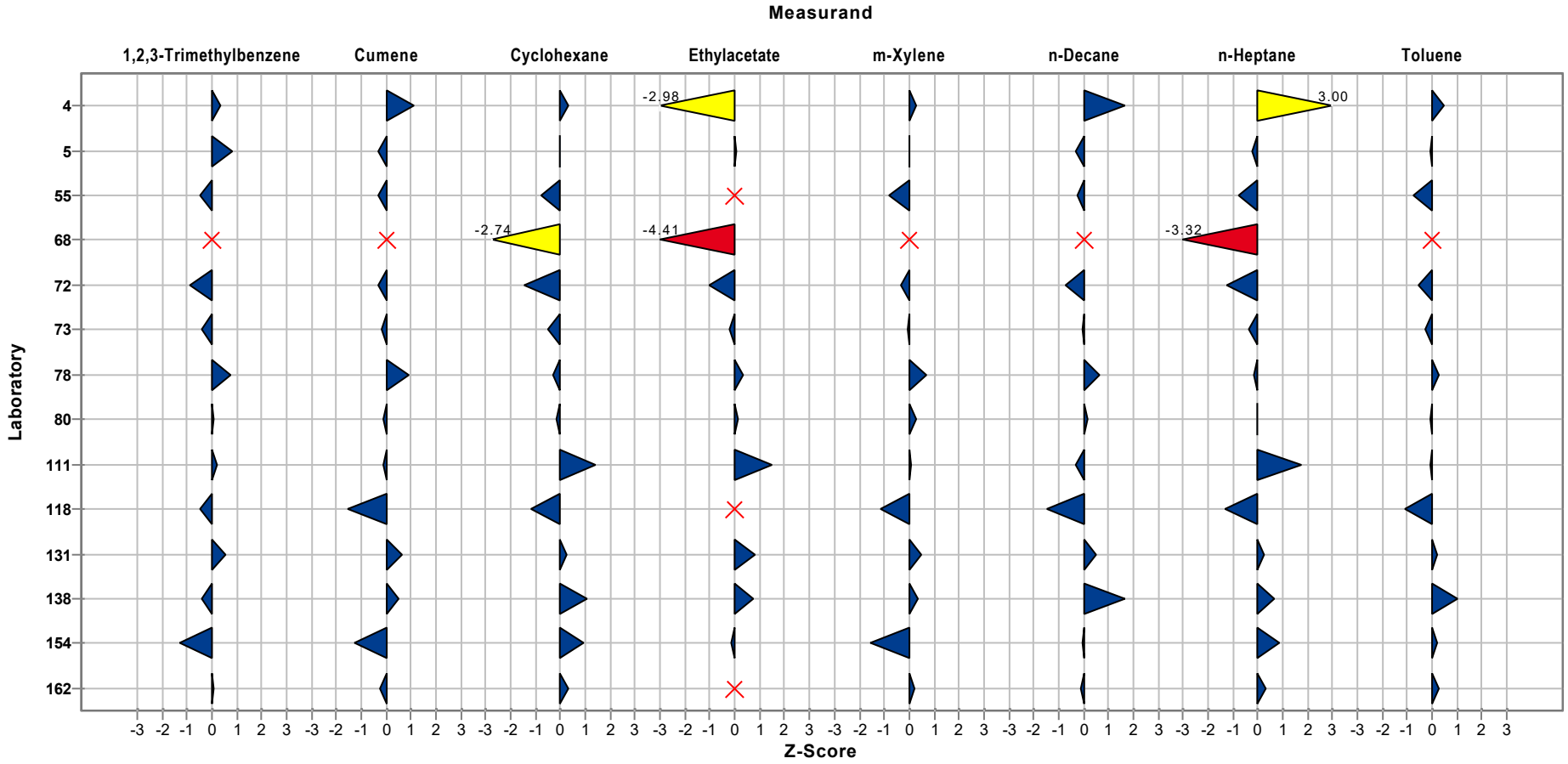
Sample chart of *Z-Scores*

Sample: 1



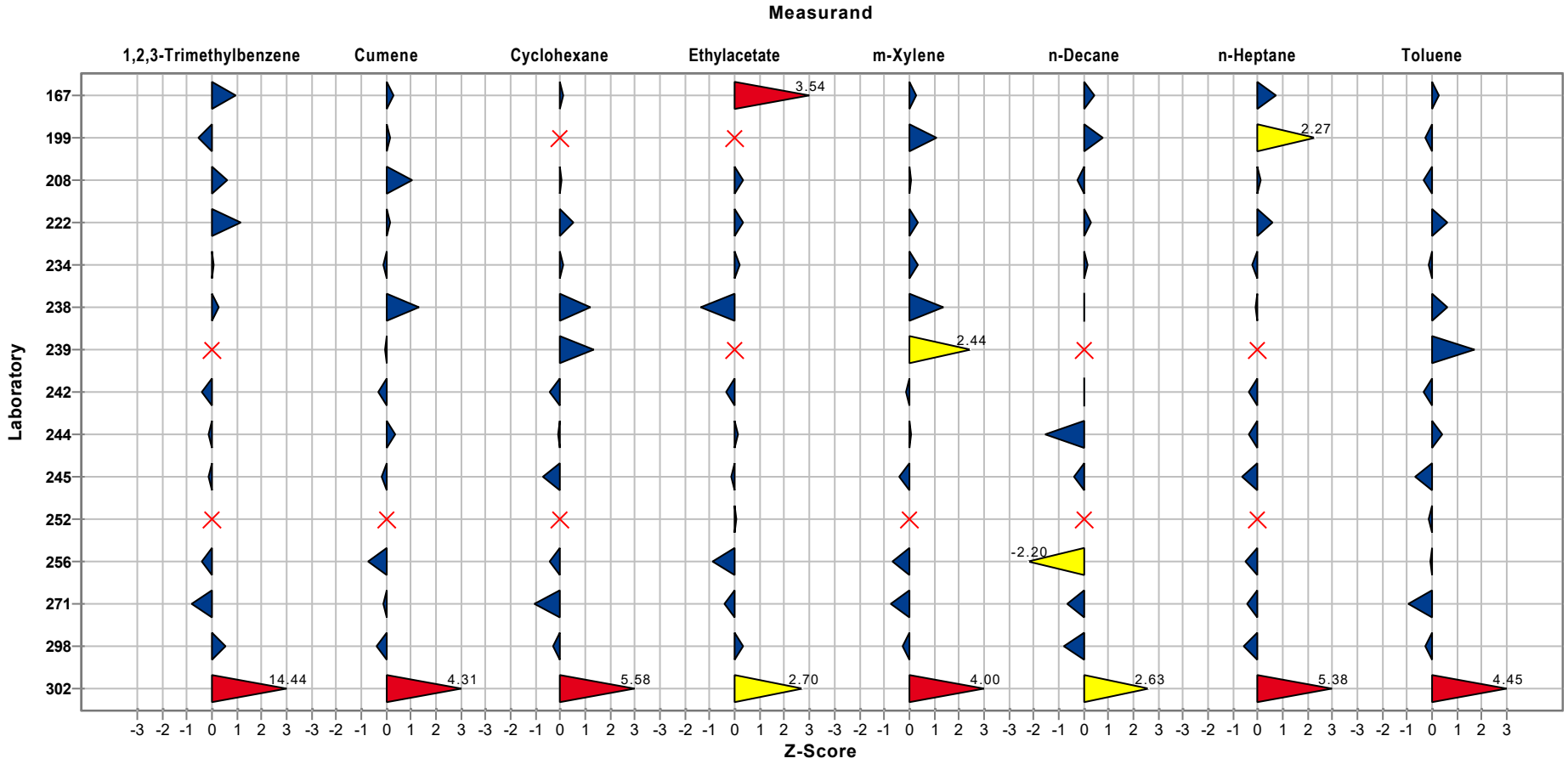
Sample chart of *Z-Scores*

Sample: **2**



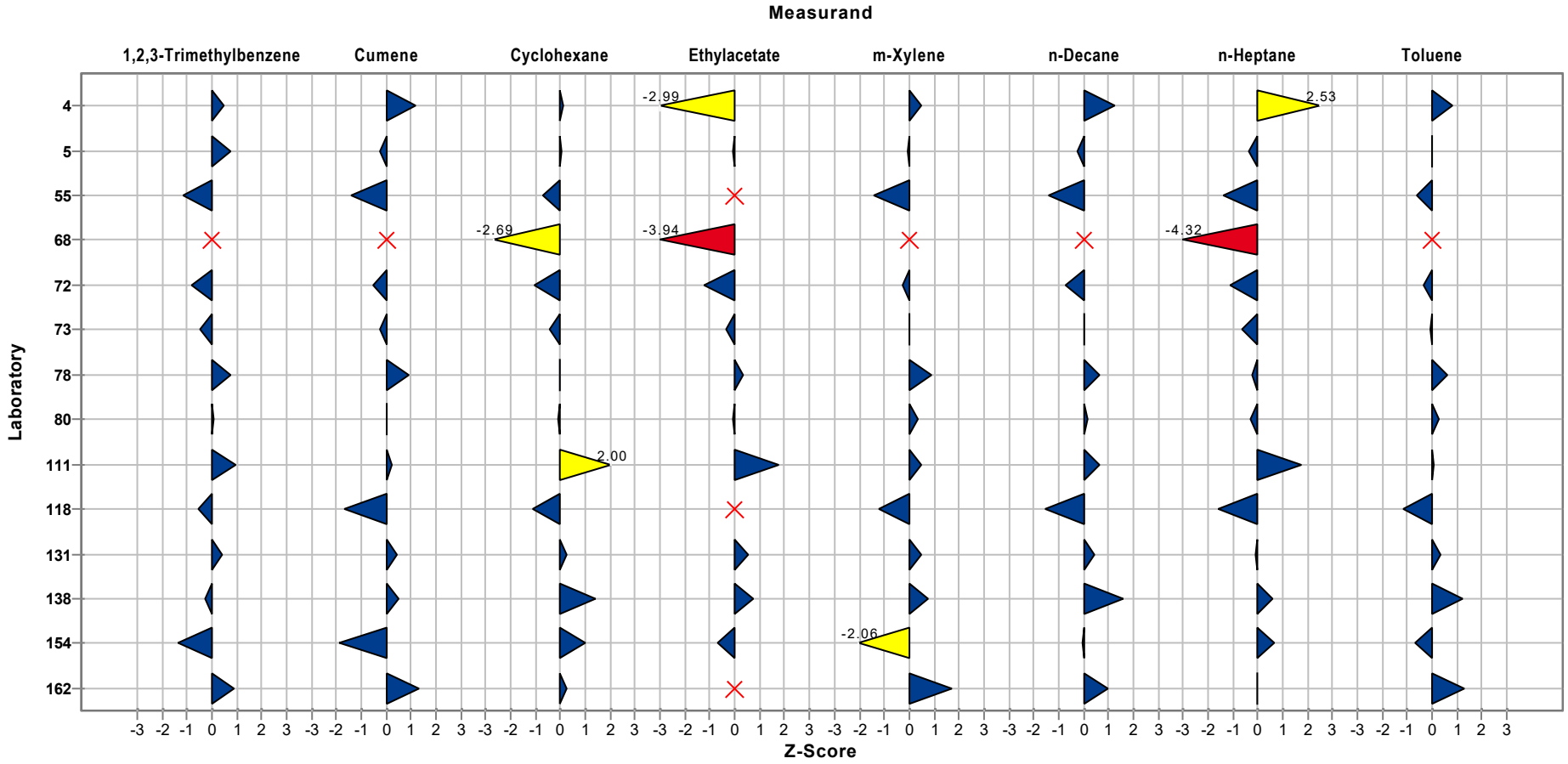
Sample chart of *Z-Scores*

Sample: **2**



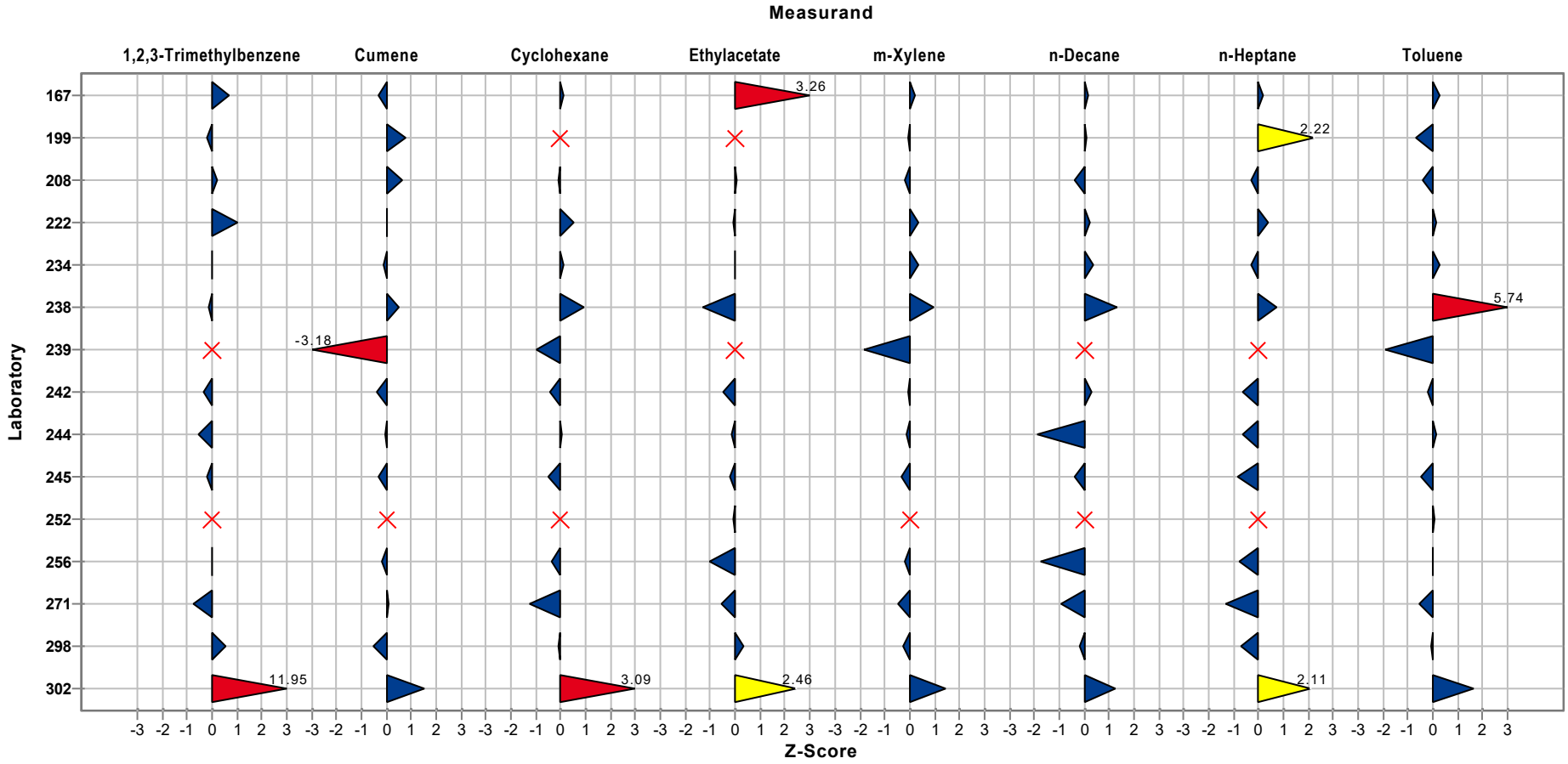
Sample chart of *Z-Scores*

Sample: 3



Sample chart of *Z-Scores*

Sample: 3



Questions and Answers

Participant	Sample carrier	Sampling pump
4	activated charcoal	SKC Personal air sampler
5	A-Kohle, Typ NIOSH, SKC	Gilian LFS
55		
68	Dräger Aktivkohle Typ NIOSH	
72	Aktivkohle Typ B	SG350
73	A-Kohle Typ B/G	
78	Aktivkohle Typ B/G	SG350ex
80	Typ BIA	
111	Aktivkohle Dräger B/G	GilAir Plus
118	NIOSH	
131	Dräger AK Typ BIA	
138	Aktivkohle, Dräger Typ G	
154	Aktivkohle Typ BIA	GilAir 5 mit Low -Flow Module und GilAir PLUS
162	NIOSH	
167	NIOSH Charcoal tubes	
199	Aktivkohleröhrchen	
208		
222	Aktivkohle Typ BIA	GilAir PLUS
234	Aktivkohle Typ B, Fa. Draeger	GilAir plus
238	/	
239		
242	Aktivkohle Typ B	LSF 113 D
244	Aktivkohle Typ NIOSH Fa. Dräger	SKC Poket Pump 210-1002MTX
245	Aktivkohle Typ BIA von Dräger	GilAir+
252	Aktivkohle Typ BIA	GilAir5, GilAir Plus, SG5200, SG5100ex
256	Dräger Aktivkohleröhrchen, Typ NIOSH	
271	Aktivkohleröhrchen Typ BIA	GSA SG 350ex
298	Dräger Aktivkohle Typ BIA	Gilian LFS 113
301	The sample was prepared in a 2 mL glass vial, which was placed in the GC's automatic sampler.	

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Participant	Sample carrier	Sampling pump
302	PG1 - Aktivkohle BIA Fa. Draeger;PG2 und PG3: Ethylacetat - Aktivkohle BIA Fa. Draeger und der Rest - Anasorb 747, Fa. SKC	GilAir plus

Participant	Flow rate sampling	Flow rate measurement	Sampling time	Analytical method
4	300 ml/min 300 ml/min	TSI	30 - 60 minutes	IFA
5	70 ml/min	Defender	2 h	Hausverfahren
55				GCMS
68				Eigene Interne Methode
72	333ml/min	Defender 520	1 bis 2 h abhängig von der Probe	validierte eigene SOP in Anlehnung an IFA-Arbeitsmappe
73				Probe 1 IFA-Arbeitsmappe 8414 , Probe 2 und 3 IFA Arbeitsmappe 7732 / 7733 / 7322
78	ca. 0,333 L / min	Gilibrator 3	120 min	IFA7732/7733
80				IFA (7322, 7732, 7733)
111	0,33 l/min	BIOS Defender M	120 Minuten	IFA 6385, 7322, 7732, 7733
118				Inhouse-Methode in Anlehnung an IFA-Arbeitsmappen
131				DFG-Luftanalysenband 1
138				IFA 7322, 7732, 7733, 6385, 6386, 6387, 7569, 8414, 8115
154	0,333 l/min	Gilibrator 3 mit Low-Flow Zelle	120 min	BGIA 7322, IFA-7732, BGIA-7733, BIA-6385, BIA-6386, BIA-6387, IFA-8414, BIA-8415, IFA-7569
162				Hausmethode, angelehnt an IFA-Kennzahlen 7732 und 7733
167				Internal method with internal standard.
199				LA-GC-012.04a
208				Based on NIOSH
222	335 ml/min	Defender 530	120 min	
234	0,330	TSI 4140	120 Minuten	BGIA 7330 und BGIA 7569 bei PG1; BGIA 7322 + BGIA 7732 + BGIA 7733 bei PG2 undPG3
238				NF X 43-267
242	0,1 l/min und 0,33 L/min	Defender 510	15, 60, und 120 min	IFA 7330 und IFA 7733
244	50 ml/min	BIOS Defender 510	105 min, 75 min, 75 min	eigene Methode
245	0,333 l/min	Mass Flow Meter 4140 von TSI	120 min	DFG-Luftanalysen Band 1
252	0,33 l/min	Gilian Gilibrator 3	120 min	Hausinterne Methode
256				VDI 2100 Blatt 2
271	0,333 l/min	DryCal DC Lite	2 h	IFA 8415, IFA 6386, IFA 7330, IFA 7569, IFA 7732, IFA 7322, IFA 7733
298	Ca. 0,33 L/min	Defender 510, 50 - 5000 ccm	Ca. 121 min	DIN CEN/TS 13649:2015-03
301				The NIOSH 1400:1994 analytical method was used.

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Participant	Flow rate sampling	Flow rate measurement	Sampling time	Analytical method
302	0,330	TSI 4140	120 Minuten	PG1 IFA 7330 und IFA 7569; PG2 und PG3 - bei Ethylacetat IFA 7322, Rest - IFA 7733

Participant	Front-, Backsection separated	Desorption solution
4	yes	1: CS2+Phenoxyethanol for all compounds beside; 1-Methoxy-2-.propanol: Dichlormethan, CS2, Methanol
5	ja	Schwefelkohlenstoff
55	yes	CS2
68	Ja	CS2
72	ja	Benzylalkohol
73	Ja	Ternäres Gemisch (CH2Cl2 : CS2 : MeOH) = 60 : 35 : 5
78	ja	ternäres Gemisch Dichlormethan 60 : Schwefelkohlenstoff 35 : Methanol 5
80	ja	Ternäres Gemisch (60 % Dichlormethan / 35 % Schwefelkohlenstoff / 5 % Methanol)
111	nein	ternäres Gemisch 60% Dichlormethan, 35% CS2, 5% Methanol
118	nein, zusammen	ternäres Gemisch (CH2CL2:CS2:MeOH) = 60:35:5
131	nein	Ternäres Gemisch
138	nein	ternäres Gemisch
154	Nein: Sammelschicht und Kontrollschicht nicht getrennt	TG1 Gemisch
162	getrennt	Schwefelkohlenstoff
167	Yes	CS2
199	nein	Dichlormethan
208	Yes	2 % DMF in CS2
234	Ja	Ternäres Gemisch (60 % Dichlormethan / 35 % Schwefelkohlenstoff / 5 % Methanol)
238	yes	Sample 1 : CS2+Dichloromethane (90/10). Sample 2 and sample 3 : CS2
242	ja	Ternäres Gemisch (CH2Cl2 : CS2 : MeOH) (60 : 35 : 5)
244	Ja	Benzylalkohol
245	nein	Ternäres Gemisch
252	Ja	DMF:CS2 (60:40)
256	nein	Diethylether und CS2
271	ja	Polar, Alkane: ternäres Gemisch; Aromaten: Schwefelkohlenstoff
298	Nein	
301	Yes, the coal sections were separated for analysis.	1 mL of Carbon sulphide with 1% (v/v) 2-Butanol.
302	Ja	ternäres Gemisch (60% Dichlormethan, 35% Schwefelkohlenstoff, 5% Methanol) bzw. benzolarmer Schwefelkohlenstoff

Participant	Volume of desorption solution
4	2-5 ml
5	1
55	2
68	1 ml
72	5ml
73	2
78	20
80	10 mL
111	5 ml (Alkohole) , 2,5 ml (Alkane/Aromaten/Ester)
118	10mL
131	10
138	10
154	10 ml
162	1,5 mL
167	1,5 mL
199	5 ml
208	1,5
234	10 mL
238	2 mL
242	10 mL
244	1,5 ml
245	10 ml
252	5 ml
256	2x 5 mL
271	Aromaten: 3 ml; Polar, Alkane: 5 ml
301	1 mL.
302	3 ml ternäres Gemisch bzw. 4ml Schwefelkohlenstoff

Participant	Gas chromatograph (GC)
4	Agilent 6890 with MSD, Thermo Fisher Trace 1310 FID
5	Agilent 8860

Participant	Gas chromatograph (GC)
55	Agilent
68	Agilent 8890
72	Agilent 7890B
73	Agilent 7890B
78	Clarus590 Perkin Elmer
80	Agilent 7890
111	Thermo TRACE 1310 GC / ISQ 7000
118	Agilent 7890A
131	Thermo Trace GC Ultra
138	Shimazu Nexis GC 2030
154	Agilent 7890A
162	Shimadzu GC-2010 Plus
167	Agilent 7890 and Agilent 8890
199	Gc/MS
208	Agilent 7890B
234	Agilent 7890
238	Sample 1 : GC.FID. Sample 2 and 3 : GC-MS
242	Agilent 7890
244	Shimadzu GC-2010
245	Thermo Trace GC Ultra
252	Shimadzu GC 2010Plus
256	Agilent Technologies 7890B
271	Thermo Scientific Trace 1310
301	Agilent Technologies 6890N Gas Chromatograph, equipped with 7683 Series Autosampler, 7683 Series Automatic Injector, flame ionization detector, and ChemStation G2070AA Revision A.09.03 software.
302	nicht bekannt

Participant	Sample injection	Carrier gas
4	FID: split; MSD: splitless	Helium
5	split 1:10	Helium
55	split	helium
68	Split	Helium

Participant	Sample injection	Carrier gas
72	Split	Helium 6.0
73	split	Wasserstoff
78	split	Helium
80	split	Helium
111	Split 1:50	He
118	on-column	Stickstoff
131	Split	Stickstoff 5.0
138	split	Stickstoff
154	split	He
162	Split	Wasserstoff
167	Splitless (Agilent 7890) and on column (Agilent 8890)	He (Agilent 7890) and N2 (Agilent 8890)
199	splitlos	Helium
208	Split	Helium
234	Split	Helium
238	split	Hydrogene
242	Split 1:20	Wasserstoff
244	split	Helium
245	split	Stickstoff 5.0
252	Split	Helium
256	splitlos	Helium
271	split	Helium
301	The samples were split injected. Split ratio: 50:1	The carrier gas used was helium.
302	split	Helium

Participant	Analytical column	Detector
4	MS: DB5 MS; FID: DB624 + DB WAX	
5	HP1 und FFAP	FID
55	RTX 502.2	MS
68	Vocol, Supelco	FID
72	Zebron ZB-Wax 30mx0,25mmx0,25µm	FID
73	DB5-MS, Länge: 60 m, ID: 0.25 mm, Belegung: 1 µm	FID

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Participant	Analytical column	Detector
78	DB1	FID
80	ZB-5 & ZB-WAXplus	FID
111	RXI-5MS	ISQ 7000 (MS)
118	DB-5 / DB-WAX	FID
131	Phenomenex ZB-5 (60m x 0,32 mm x 1,0 µm	FID
138	Restec RTX- Volatiles, 60m x 0,32 mm, 1,5 µm Schichtdicke	FID
154	Rtx-VMS 60 für aliphatische und aromatische KW, DB Wax UI für Alkohle	MSD Agilent 5975C
162	unpolare Kapillarsäule CP Sil PONA	FID
167	Agilent DB 624 30m, 0,25mm id, 1,4 µm (Agilent 7890N), Restek Porapak PS 80/20 2m, 2mm id (Agilent 8890)	FID
199	DB-5625 und DB-1701	MS
208	HP5 and InnoWax	FID
234	ZB-5 & ZB-WAXplus	nicht bekannt
238	DB624	Sample 1 : GC.FID. Sample 2 and 3 : GC-MS
242	HP 5, 50m x 0,32mm; df 1,05 µm	FID
244	Zebron ZB-5MSi 30m x 0,25mm x 0,25µm	Shimadzu GCMS-QP2020
245	Phenomenex ZB-5 (60 m x 0,32 mm x 1,0 µm)	FID
252	Rxi-5Sil MS	FID
256	RTx-624 (L = 40 m, ID = 0.18 mm, FD = 1 µl)	MSD
271	Aromaten: Thermo TG-1301MS, 30 m x 0,25 mm, 1,0 µm Filmdicke; Polare und Alkane: MN Optima 1, 30 m x 0,25 mm, 0,50 µm Filmdicke	Aromaten: MS ISQ; Polare und Alkane: MS ISQ LT
301		A flame ionization detector was used.
302	nicht bekannt	nicht bekannt

Participant	Data evaluation
4	external
5	interner Standard, mittels RT
55	internal standard
68	Externer Standard
72	externer Standard (6 Pkt. Kalibrierung)
73	Interner Standard
78	interner Standard
80	Interner Standard

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Participant	Data evaluation
111	interner Standard und Kontrollstandard
118	interner Standard
131	extern
138	externer Standard
154	interner Standard
162	interner Standard
167	Internal Standard
199	interner Std in der Probe/ Auswertung gegen externen Standard
234	Interner Standard, Referenzsubstanzen
238	Internal
242	interner Standard
244	externer Standard
245	extern
252	Externer Standard (bei Prüfgas 2 und 3 - ISTD gestört)
256	Interner Standard
271	Polar, Alkane: interner Standard Undecan; Aromaten: interner Standard Chlorbenzol
301	The quantification and identification of organic compounds is based on the areas of the peaks obtained using the external standard method.
302	Referenzsubstanzen, z.B. ternäres Gemisch Fa. Accu-Standard bzw. Referenzsubstanzen, z.B. Schwefelkohlen-stoff Fa. Promochem

Participant	Recovery rates	Date of analysis
4	Yes	26.02.2025
5	Nein	
55	yes	25.02.2025
68	Nein	25.03.2025
72	ja	siehe oben
73	Nein	Probe 1 17.02.25 / Probe 2 + 3 18.02.2025
78	nein	Probenvorbereitung 13.02.2025 - Analytik 14.02.2025
80	nein	18.02.2025
111	nein	04.03.2025
118		06.03.2025
131	nein	03.03.2025

Organic Solvents 2025 - corrected

Participant	Recovery rates	Date of analysis
138	nein	18.02.2025 - 12.03.2025
154	ja	05.03.2025
162	ja	26.02.2025
167	No	Between 28/2 and 13/3 2025
199	nein	24.02.2025
234	nein	19.02.2025
238	No	19.02.2025
242	nein	siehe Ergebnisse
244	ja	19.02.2025, 24.02.2025, 25.02.2025
245	nein	03.03.2025
252	Nein	11.03.2025
256	ja	18.02.2025
271	nein	13.02. - 20.02.2025
301	The results obtained have not been corrected with the recovery rates.	The samples were analyzed on March 11, 2025.
302	nicht bekannt	28.02.-07.03.2025