

Round-robin tests for in-house measuring laboratories

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Results and Evaluation

Round-robin test

„Organic substances with thermodesorption 2014“

Summary of laboratory means

Sample 1

Unit	n-Butyl acetate	Z score	n-Heptane	Z score	Toluene	Z score	n-Octane	Z score	p-Xylene	Z score
	$\mu\text{g}/\text{m}^3$		$\mu\text{g}/\text{m}^3$		$\mu\text{g}/\text{m}^3$		$\mu\text{g}/\text{m}^3$		$\mu\text{g}/\text{m}^3$	
22	55,000	2,91 CE	83,000	10,68 BE			42,000	6,96 BE	28,500	0,83
28	51,915	2,38 E	42,420	2,20 E	36,295	2,60 E	29,510	2,90 E	35,620	2,70 E
30	30,200	-1,41	32,850	0,20	17,700	-2,15 E	20,900	0,11	16,650	-2,29 E
36	37,550	-0,13	31,600	-0,06	26,250	0,03	20,200	-0,12	26,500	0,30
45	53,415	2,64 E	16,980	-3,12 E	10,280	-4,04 FE	8,310	-3,97 FE	7,865	-4,60 FE
52	35,300	-0,52	33,800	0,40	32,800	1,71	20,700	0,05	36,200	2,85 E
55	36,050	-0,39	32,300	0,09	24,900	-0,31	19,400	-0,37	25,400	0,01
60	31,700	-1,14	27,900	-0,83	22,150	-1,01	18,900	-0,54	20,650	-1,24
61	34,390	-0,68	23,190	-1,82	19,760	-1,62	21,560	0,33	22,100	-0,85
68	37,800	-0,08	40,100	1,72	31,950	1,49	24,850	1,39 C	26,950	0,42
135	49,050	1,88	37,500	1,17	30,800	1,20	24,850	1,39	31,550	1,63
139	31,000	-1,27	32,500	0,13	26,500	0,10	14,000	-2,13 E	13,500	-3,12 E
148	32,535	-1,00	23,775	-1,70	23,845	-0,58	16,675	-1,26	23,955	-0,37
155	45,850	1,32	36,900	1,05	30,300	1,07	22,650	0,68	30,250	1,29
169	36,250	-0,35	37,250	1,12 C	18,750	-1,88 C	21,000	0,14	24,750	-0,16
183	44,000	1,00	29,000	-0,60	32,000	1,50	27,000	2,09 E	31,000	1,49
186	39,450	0,20	35,550	0,76	27,100	0,25	21,700	0,37	27,800	0,64
191	37,500	-0,13	32,500	0,13	28,000	0,48	22,000	0,47	31,000	1,49
192	35,695	-0,45	34,405	0,53	24,050	-0,53	20,850	0,10	23,770	-0,42
193	25,910	-2,15 CE	26,345	-1,16	16,785	-2,38 E	15,000	-1,80	19,285	-1,59
199	33,900	-0,76	24,200	-1,61	24,500	-0,41	25,400	1,57	24,800	-0,14
206	37,220	-0,18	34,050	0,45	24,080	-0,52	17,950	-0,84	24,130	-0,32
207	49,500	1,96	38,000	1,28	31,000	1,25	22,500	0,63	30,500	1,35
208	31,500	-1,18	27,000	-1,02	20,000	-1,56	16,000	-1,48	21,000	-1,14
214	34,500	-0,66	35,000	0,65	27,000	0,23	21,500	0,31	12,000	-3,51 E
237	38,250	0,00	31,000	-0,19	26,650	0,14	20,200	-0,12	27,750	0,63
265	31,000	-1,27	31,000	-0,19	21,500	-1,18	16,000	-1,48	25,000	-0,09
270	39,000	0,13	31,500	-0,08	25,000	-0,29	19,650	-0,29	23,000	-0,62
273	44,500	1,08	43,000	2,32 E	33,800	1,96	24,500	1,28	31,500	1,62

	n-Butyl acetate	Z score	n-Heptane	Z score	Toluene	Z score	n-Octane	Z score	p-Xylene	Z score
274	34,000	-0,74	27,000	-1,02	20,000	-1,56	17,000	-1,15	22,000	-0,88
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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	
Mean	38,273		31,892		26,118		20,555		25,349	
Reproducibility s.d.	6,800		5,909		5,005		3,645		5,949	
Rel. reproducibility s.d.	17,77 %		18,53 %		19,16 %		17,73 %		23,47 %	
Reference value	35,030		30,280		23,870		19,400		25,490	
Target s.d.	5,741		4,784		3,918		3,083		3,802	
Rel. target s.d.:	15,00 %		15,00 %		15,00 %		15,00 %		15,00 %	
Lower limit of tolerance	26,791		22,324		18,283		14,388		17,744	
Upper limit of tolerance	49,755		41,460		33,954		26,721		32,954	
Type B outliers	0		1		0		1		0	
Type F outliers	0		0		1		1		1	
No. of laboratories that submitted results	30		30		29		30		30	
No. of laboratories after elimination of outliers type A-D and F (without laboratories that only gave states but no measured values)	28		28		27		27		29	

Explanation of outlier types

A: Single outlier Grubbs

B: Differing laboratory mean Grubbs

C: Excessive laboratory s.d. Cochran

D: Excluded manually

E: score outside tolerance limits

F: |Score|>3,5

	n-Dodecane	Z score	2-Butoxyethanol	Z score
Unit	µg/m³		µg/m³	
22	22,500	2,01 E	32,500	1,13
28	22,770	2,11 E	26,635	-0,28
30	13,600	-1,42	8,550	-4,62 FE
36	13,200	-1,58	23,500	-1,03

	n-Dodecane	Z score	2-Butoxyethanol	Z score
45	7,415	-3,81 FE	< 5,000	
52	30,050	4,92 FE	19,900	-1,89
55	13,850	-1,33	26,900	-0,22
60	11,900	-2,08 E	19,400	-2,01 E
61	21,070	1,46	21,350	-1,55
68	18,150	0,33	31,750	0,95 C
135	22,500	2,01 E	42,650	3,56 FE
139	22,500	2,01 E	38,500	2,57 E
148	14,385	-1,12	25,705	-0,50
155	22,100	1,85	32,100	1,03
169	19,150	0,72	26,700	-0,26
183	20,000	1,04	32,000	1,01
186	18,050	0,29	28,850	0,25
191	31,000	5,28 FE	38,500	2,57 E
192	13,920	-1,30	8,220	-4,70 FE
193	11,235	-2,34 E	26,275	-0,37
199	14,050	-1,25	35,150	1,76
206	15,900	-0,54	28,710	0,22
207	19,500	0,85	43,000	3,65 FE
208	12,000	-2,04 E	23,000	-1,15
214	17,500	0,08	26,500	-0,31
237	19,050	0,68	31,700	0,94
265	16,000	-0,50	23,000	-1,15
270	16,550	-0,29	20,100	-1,85
273	22,500	2,01 E	35,500	1,85
274	19,000	0,66	28,000	0,05
-	-	--	-	--
Method	ISO 5725-2		ISO 5725-2	
Assessment	Z <=2,00		Z <=2,00	
Mean	17,294		27,800	
Reproducibility s.d.	3,882		5,770	
Rel. reproducibility s.d.	22,45 %		20,76 %	
Reference value	16,900		23,660	
Target s.d.	2,594		4,170	

	n-Dodecane	Z score	2-Butoxyethanol	Z score
Rel. target s.d.:	15,00 %		15,00 %	
Lower limit of tolerance	12,106		19,460	
Upper limit of tolerance	22,482		36,140	
Type B outliers	0		0	
Type F outliers	3		4	
No. of laboratories that submitted results	30		30	
No. of laboratories after elimination of outliers type A-D and F (without laboratories that only gave states but no measured values)	27		24	
Explanation of outlier types				
A: Single outlier				
B: Differing laboratory mean				
C: Excessive laboratory s.d.				
D: Excluded manually				
E: score outside tolerance limits				
F: Score >3,5				

Summary of laboratory means

Sample 2

Unit	n-Butyl acetate		n-Heptane		Toluene		n-Octane		p-Xylene	
	$\mu\text{g}/\text{m}^3$	Z score	$\mu\text{g}/\text{m}^3$	Z score	$\mu\text{g}/\text{m}^3$	Z score	$\mu\text{g}/\text{m}^3$	Z score	$\mu\text{g}/\text{m}^3$	Z score
22	94,000	1,80	174,000	12,34 BE			85,000	7,58 BE	55,000	0,50
28	98,975	2,25 E	80,165	2,09 E	68,305	2,49 CE	57,165	2,92 E	68,730	2,29 E
30	66,650	-0,66	65,950	0,54	50,050	0,04	42,000	0,37	48,050	-0,41
36	74,550	0,05	62,150	0,12	51,050	0,18	38,300	-0,25	50,300	-0,11
45	75,060	0,10	42,455	-2,03 E	26,875	-3,06 BE	22,145	-2,95 E	22,995	-3,67 FE
52	69,450	-0,41	62,750	0,19	57,700	1,07	37,250	-0,42	60,350	1,20
55	70,900	-0,28	63,000	0,21	52,350	0,35	39,700	-0,01	51,650	0,06
60	65,850	-0,73	53,650	-0,81	43,900	-0,78	37,300	-0,41	43,400	-1,01
61	59,080	-1,34	50,890	-1,11	50,300	0,07	52,990	2,22 E	49,840	-0,17
68	70,450	-0,32	67,500	0,70	52,100	0,32	45,500	0,96	47,650	-0,46
135	91,250	1,55	68,050	0,76	57,500	1,04 C	46,200	1,08	58,400	0,94
139	63,500	-0,95	55,500	-0,61	54,500	0,64 C	39,000	-0,13	35,500	-2,04 E
148	67,115	-0,62	46,075	-1,63	45,105	-0,62	31,615	-1,37	47,280	-0,51
155	90,550	1,49	70,050	0,98	58,200	1,13	46,200	1,08	61,100	1,29
169	75,400	0,13	79,550	2,02 CE	50,000	0,03	43,300	0,59	52,150	0,13
183	84,000	0,90	52,000	-0,99	61,000	1,51	49,000	1,55	61,000	1,28
186	82,550	0,77	71,100	1,10	54,400	0,62	43,350	0,60	57,900	0,88
191	68,000	-0,54	55,000	-0,66	51,500	0,24	39,500	-0,05	56,500	0,69
192	72,830	-0,11	65,990	0,54	46,775	-0,40	40,390	0,10	46,265	-0,64
193	57,690	-1,47	53,820	-0,79	34,210	-2,08 E	28,560	-1,88	32,705	-2,41 CE
199	57,500	-1,49	54,250	-0,74	48,100	-0,22	37,700	-0,35	56,400	0,68
206	79,010	0,45	69,780	0,95	48,430	-0,18	38,090	-0,28	49,350	-0,24
207	91,500	1,58	69,500	0,92	55,500	0,77	43,500	0,62	59,500	1,08
208	66,500	-0,68	54,000	-0,77	42,500	-0,97	33,000	-1,14	43,500	-1,00
214	73,500	-0,05	69,500	0,92	52,000	0,30	43,000	0,54	26,000	-3,28 E
237	76,400	0,22	57,000	-0,44	49,900	0,02	37,750	-0,34	52,150	0,13
265	60,000	-1,26	56,500	-0,50	45,000	-0,64	33,000	-1,14	49,500	-0,22
270	76,000	0,18	61,500	0,05	47,500	-0,30	38,500	-0,21	45,000	-0,80
273	81,600	0,68	72,800	1,28	62,000	1,64	42,000	0,37	56,000	0,63

	n-Butyl acetate	Z score	n-Heptane	Z score	Toluene	Z score	n-Octane	Z score	p-Xylene	Z score
274	74,000	0,00	57,000	-0,44	41,000	-1,17	38,000	-0,30	53,000	0,24
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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	
Mean	74,001		61,047		49,742		39,772		51,175	
Reproducibility s.d.	11,037		8,962		6,047		7,017		8,930	
Rel. reproducibility s.d.	14,91 %		14,68 %		12,16 %		17,64 %		17,45 %	
Reference value	72,350		61,060		48,760		39,000		51,480	
Target s.d.	11,100		9,157		7,461		5,966		7,676	
Rel. target s.d.:	15,00 %		15,00 %		15,00 %		15,00 %		15,00 %	
Lower limit of tolerance	51,800		42,733		34,820		27,841		35,822	
Upper limit of tolerance	96,201		79,361		64,665		51,704		66,527	
Type B outliers	0		1		1		1		0	
Type F outliers	0		0		0		0		1	
No. of laboratories that submitted results	30		30		29		30		30	
No. of laboratories after elimination of outliers type A-D and F (without laboratories that only gave states but no measured values)	30		28		25		29		28	

Explanation of outlier types

A: Single outlier Grubbs

B: Differing laboratory mean Grubbs

C: Excessive laboratory s.d. Cochran

D: Excluded manually

E: score outside tolerance limits

F: |Score|>3,5

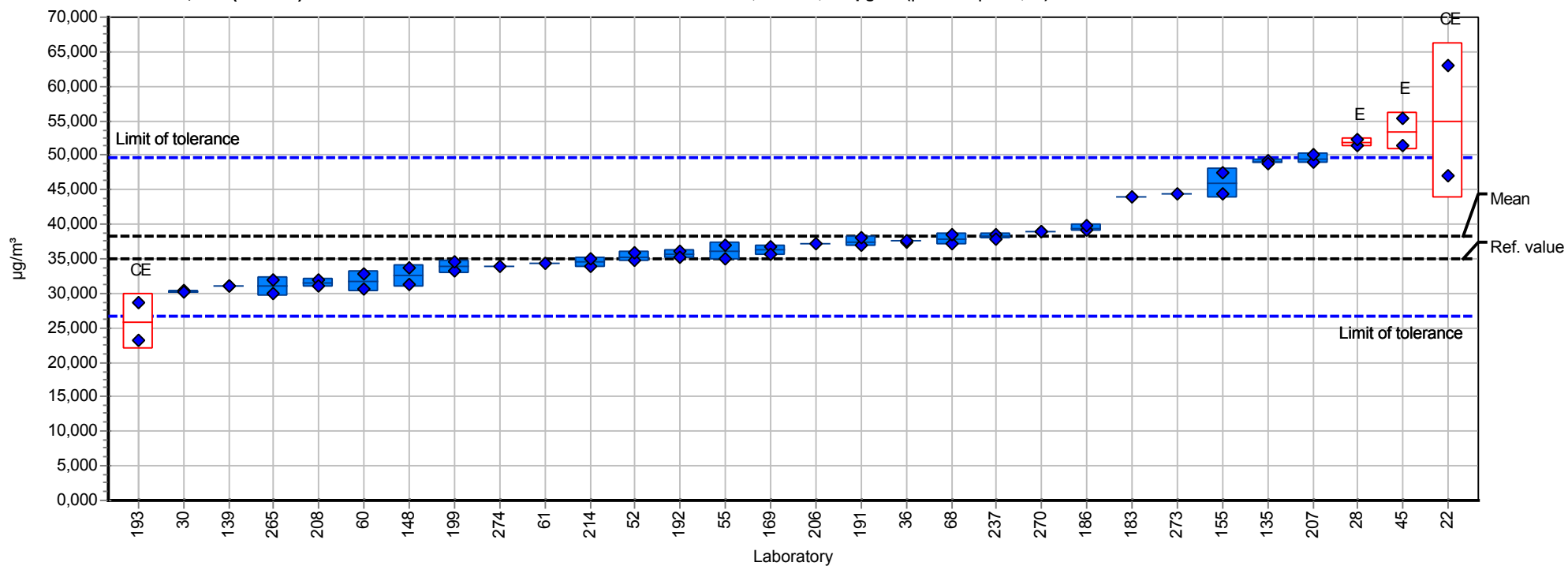
	n-Dodecane	Z score	Decamethylcyclopentasiloxane	Z score	2-Butoxyethanol	Z score
Unit	µg/m³		µg/m³		µg/m³	
22	55,000	0,83	53,000	-2,05 E	58,000	0,33
28	60,970	1,65	86,155	0,84	51,160	-0,50
30	48,600	-0,04	73,600	-0,25	34,100	-2,56 E
36	48,700	-0,03	84,350	0,69	53,550	-0,21

	n-Dodecane	Z score	Decamethylcyclopentasiloxane	Z score	2-Butoxyethanol	Z score
45	29,575	-2,63 E	52,555	-2,08 E	< 5,000	
52	51,650	0,38	65,550	-0,95	41,800	-1,63
55	39,350	-1,30			57,300	0,24
60	45,350	-0,48	63,400	-1,14	43,900	-1,37
61	47,130	-0,24	50,940	-2,23 E	52,240	-0,37
68	44,400	-0,61	67,300	-0,80	75,250	2,40 E
135	62,400	1,84	88,300	1,03	76,700	2,58 E
139	51,000	0,29	68,000	-0,74	54,500	-0,10
148	34,900	-1,91	92,870	1,43	47,330	-0,96
155	60,700	1,61	90,100	1,19	64,700	1,13
169	47,250	-0,22 C	73,750	-0,24	49,950	-0,65
183	57,000	1,11	93,000	1,44	61,000	0,69
186	56,150	0,99	86,800	0,90	61,900	0,80
191	87,000	5,20 BE	86,000	0,83	70,000	1,77
192	42,720	-0,84	107,150	2,67 E	16,130	-4,72 E
193	39,790	-1,24	62,920	-1,18	50,370	-0,59
199	35,200	-1,87	60,950	-1,35	69,950	1,77
206	49,060	0,02	70,830	-0,49	57,000	0,20
207	58,500	1,31	94,000	1,53	88,000	3,94 E
208	41,000	-1,08	62,500	-1,22	49,500	-0,70
214	55,000	0,83	133,000	4,93 BE	54,000	-0,16
237	51,450	0,35	79,200	0,24	58,050	0,33
265	50,000	0,15	70,000	-0,56	48,000	-0,88
270	51,500	0,36	81,500	0,44	37,000	-2,21 E
273	65,200	2,23 E	82,800	0,55	75,300	2,41 E
274	53,000	0,56	79,000	0,22	53,000	-0,28
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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	48,884		76,469		55,303	
Reproducibility s.d.	9,066		14,075		11,623	
Rel. reproducibility s.d.	18,55 %		18,41 %		21,02 %	
Reference value	52,540		76,010		49,650	
Target s.d.	7,333		11,470		8,295	

	n-Dodecane	Z score	Decamethylcyclopentasiloxane	Z score	2-Butoxyethanol	Z score
Rel. target s.d.:	15,00 %		15,00 %		15,00 %	
Lower limit of tolerance	34,219		53,529		38,712	
Upper limit of tolerance	63,549		99,410		71,894	
Type B outliers	1		1		0	
Type F outliers	0		0		0	
No. of laboratories that submitted results	30		29		30	
No. of laboratories after elimination of outliers type A-D and F (without laboratories that only gave states but no measured values)	28		28		27	
Explanation of outlier types						
A: Single outlier						
B: Differing laboratory mean						
C: Excessive laboratory s.d.						
D: Excluded manually						
E: score outside tolerance limits						
F: Score >3,5						

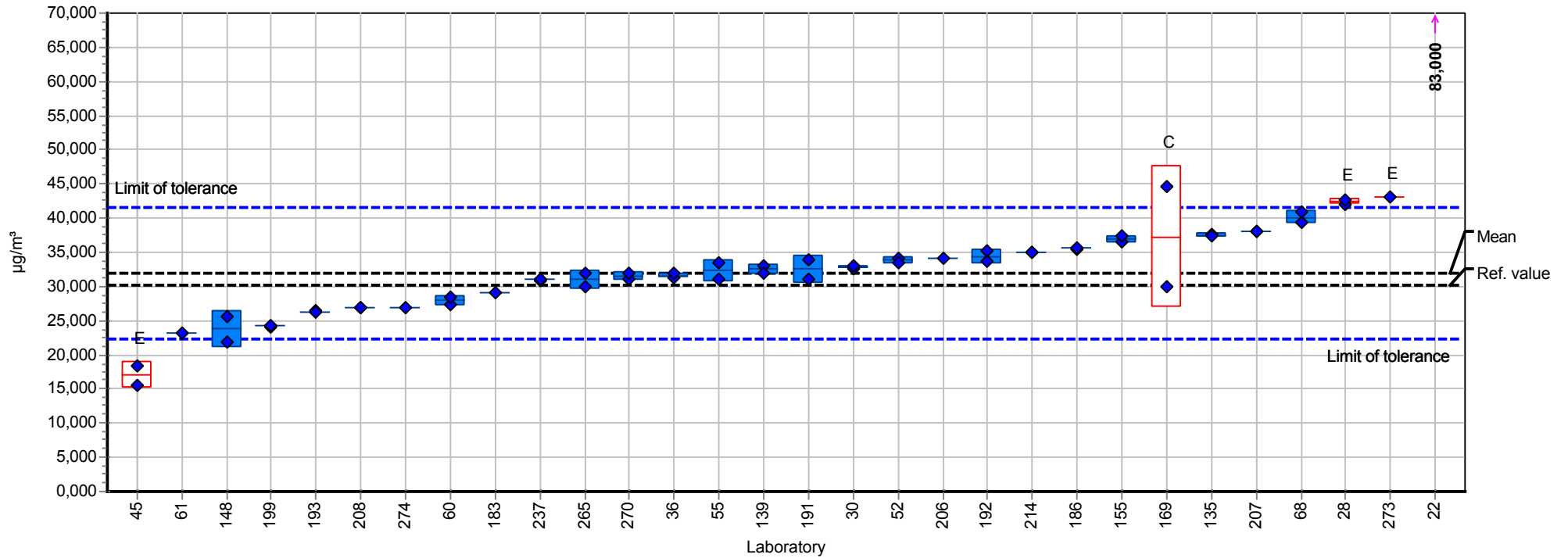
Summary results

Measurand:	n-Butyl acetate	Mean:	38,273 µg/m ³
Sample:	1	Reproducibility s.d.:	6,800 µg/m ³
Method:	ISO 5725-2	Relative reproducibility s.d.:	17,77%
No. of laboratories:	28	Reference value:	35,030 µg/m ³
Relative target s.d.:	15,00% (Limited)	Range of tolerance:	26,791 - 49,755 µg/m ³ (Z-Score <= 2,00)



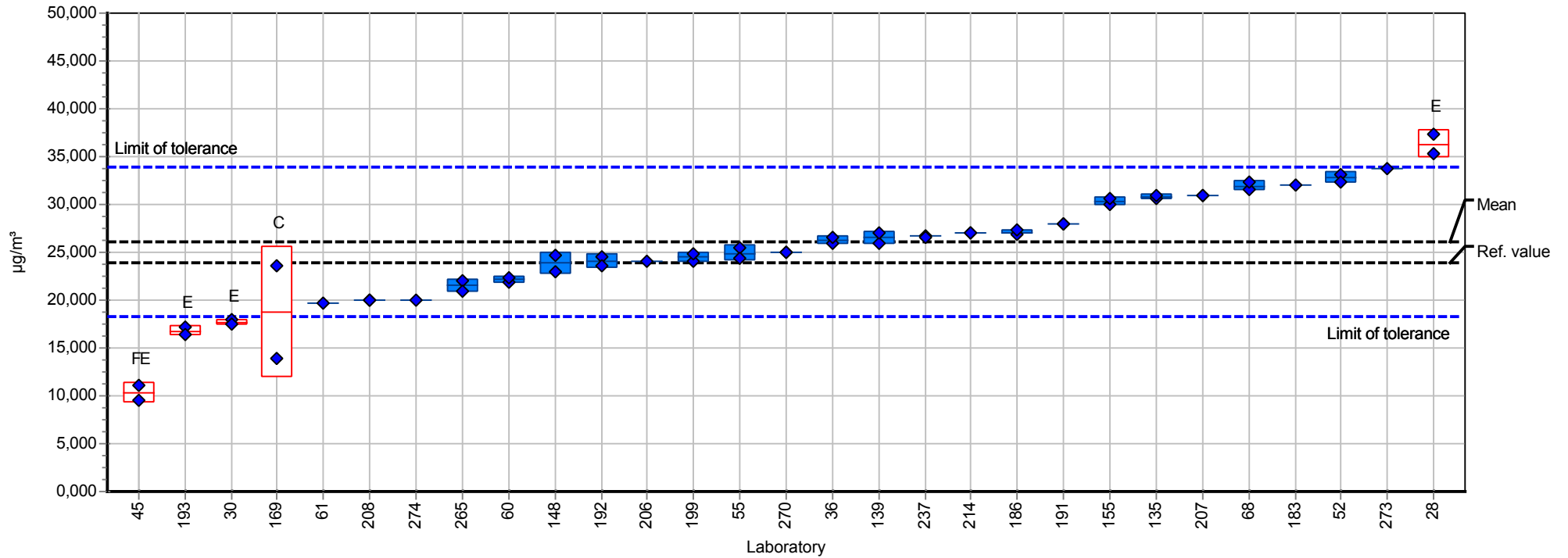
Summary results

Measurand:	n-Heptane	Mean:	31,892 µg/m³
Sample:	1	Reproducibility s.d.:	5,909 µg/m³
Method:	ISO 5725-2	Relative reproducibility s.d.:	18,53%
No. of laboratories:	28	Reference value:	30,280 µg/m³
Relative target s.d.:	15,00% (Limited)	Range of tolerance:	22,324 - 41,460 µg/m³ (Z-Score <= 2,00)



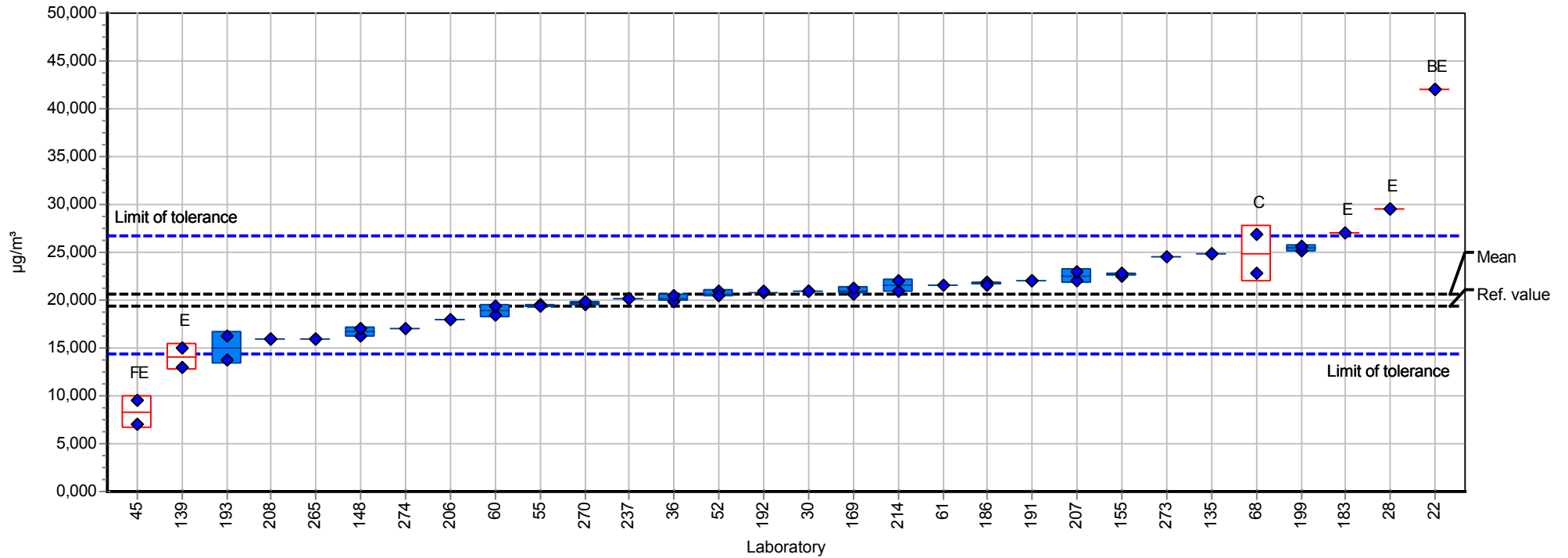
Summary results

Measurand:	Toluene	Mean:	26,118 µg/m³
Sample:	1	Reproducibility s.d.:	5,005 µg/m³
Method:	ISO 5725-2	Relative reproducibility s.d.:	19,16%
No. of laboratories:	27	Reference value:	23,870 µg/m³
Relative target s.d.:	15,00% (Limited)	Range of tolerance:	18,283 - 33,954 µg/m³ (Z-Score <= 2,00)



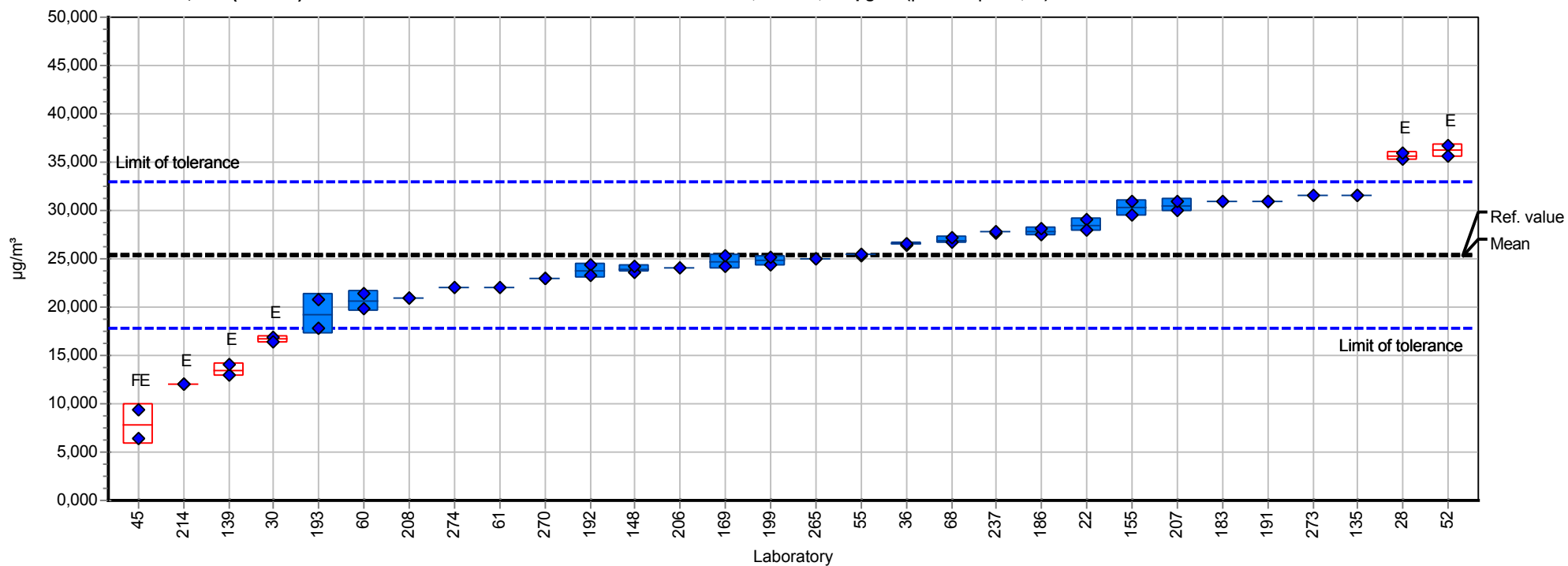
Summary results

Measurand:	n-Octane	Mean:	20,555 µg/m³
Sample:	1	Reproducibility s.d.:	3,645 µg/m³
Method:	ISO 5725-2	Relative reproducibility s.d.:	17,73%
No. of laboratories:	27	Reference value:	19,400 µg/m³
Relative target s.d.:	15,00% (Limited)	Range of tolerance:	14,388 - 26,721 µg/m³ (Z-Score ≤ 2,00)



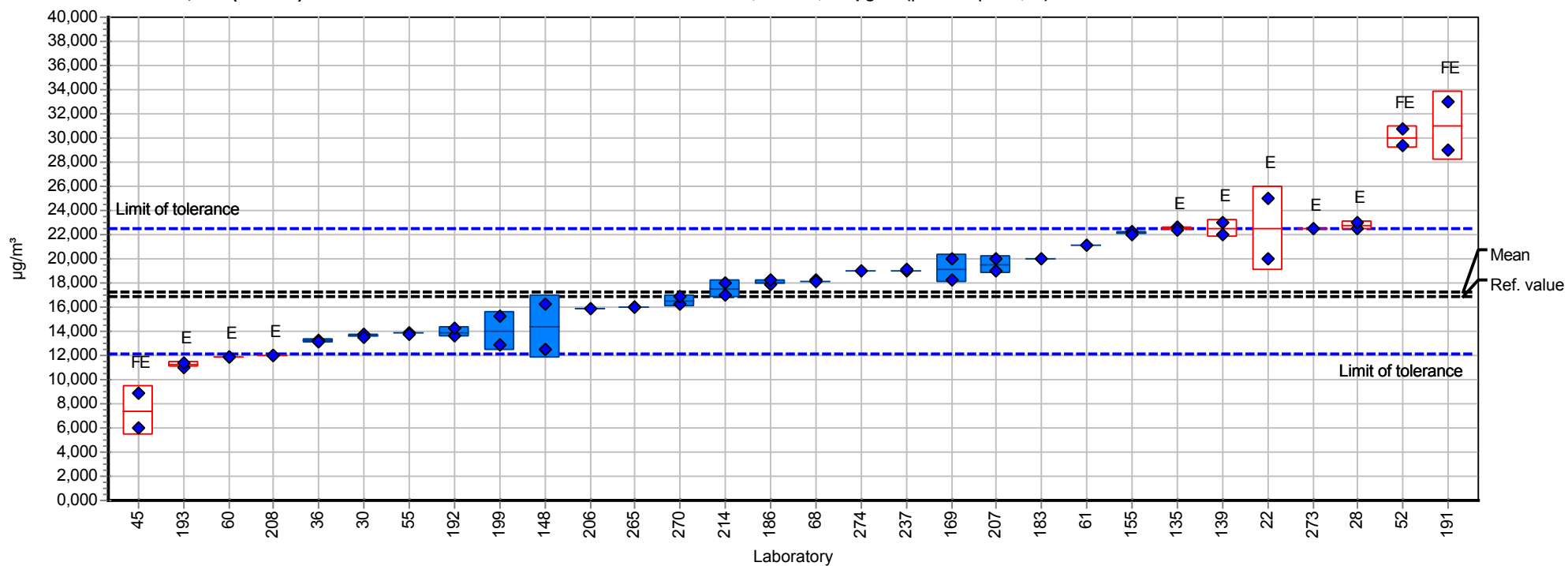
Summary results

Measurand:	p-Xylene	Mean:	25,349 µg/m ³
Sample:	1	Reproducibility s.d.:	5,949 µg/m ³
Method:	ISO 5725-2	Relative reproducibility s.d.:	23,47%
No. of laboratories:	29	Reference value:	25,490 µg/m ³
Relative target s.d.:	15,00% (Limited)	Range of tolerance:	17,744 - 32,954 µg/m ³ (Z-Score <= 2,00)



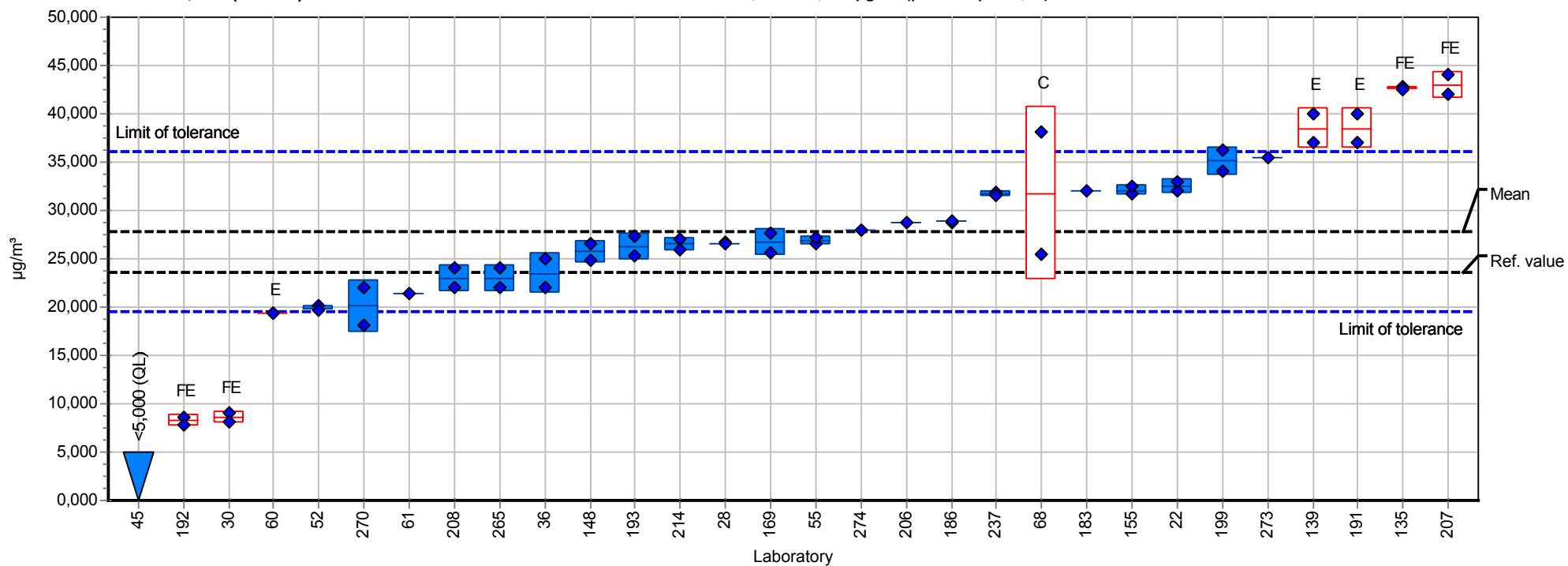
Summary results

Measurand:	n-Dodecane	Mean:	17,294 µg/m ³
Sample:	1	Reproducibility s.d.:	3,882 µg/m ³
Method:	ISO 5725-2	Relative reproducibility s.d.:	22,45%
No. of laboratories:	27	Reference value:	16,900 µg/m ³
Relative target s.d.:	15,00% (Limited)	Range of tolerance:	12,106 - 22,482 µg/m ³ (Z-Score <= 2,00)



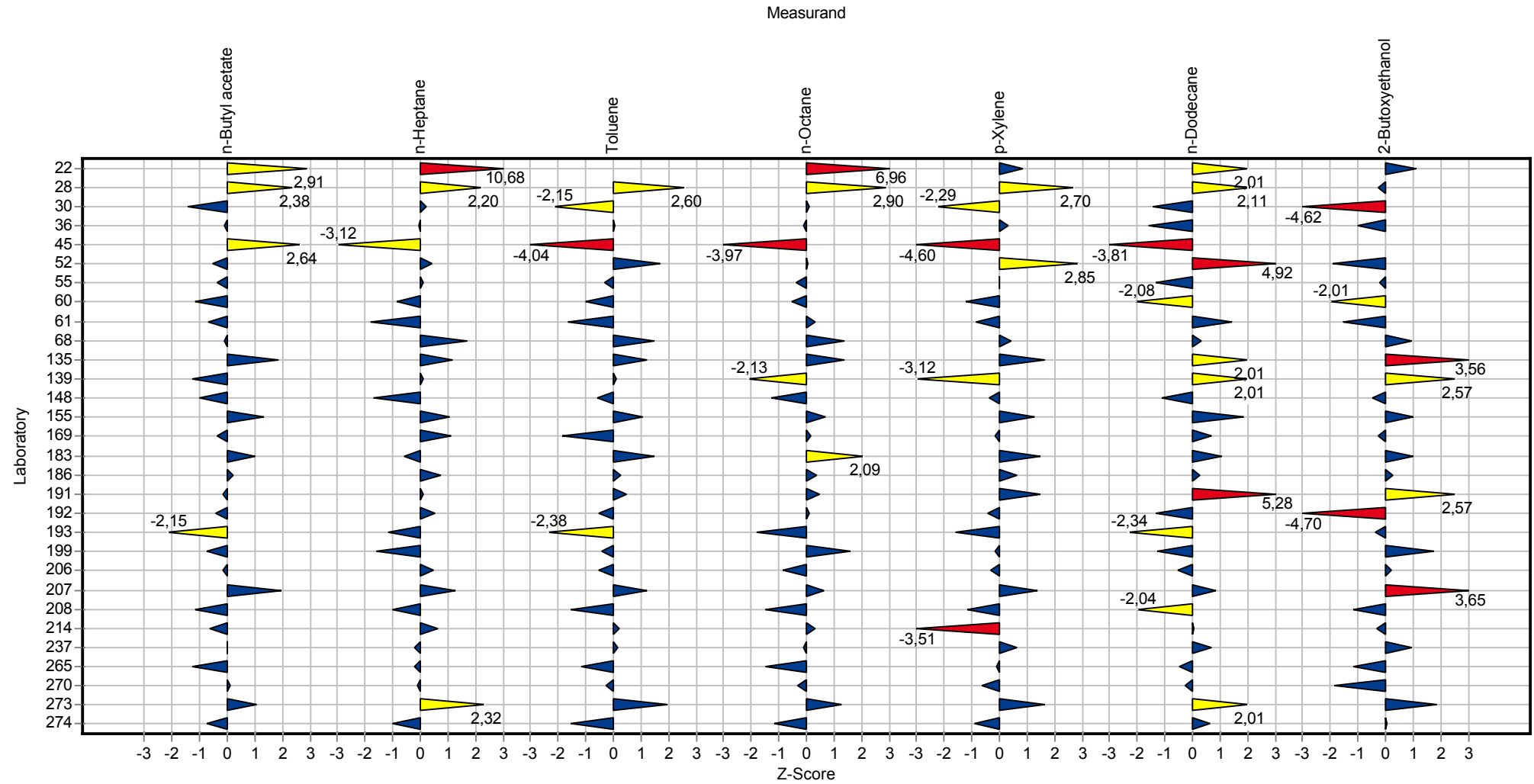
Summary results

Measurand:	2-Butoxyethanol	Mean:	27,800 µg/m ³
Sample:	1	Reproducibility s.d.:	5,770 µg/m ³
Method:	ISO 5725-2	Relative reproducibility s.d.:	20,76%
No. of laboratories:	24	Reference value:	23,660 µg/m ³
Relative target s.d.:	15,00% (Limited)	Range of tolerance:	19,460 - 36,140 µg/m ³ (Z-Score ≤ 2,00)



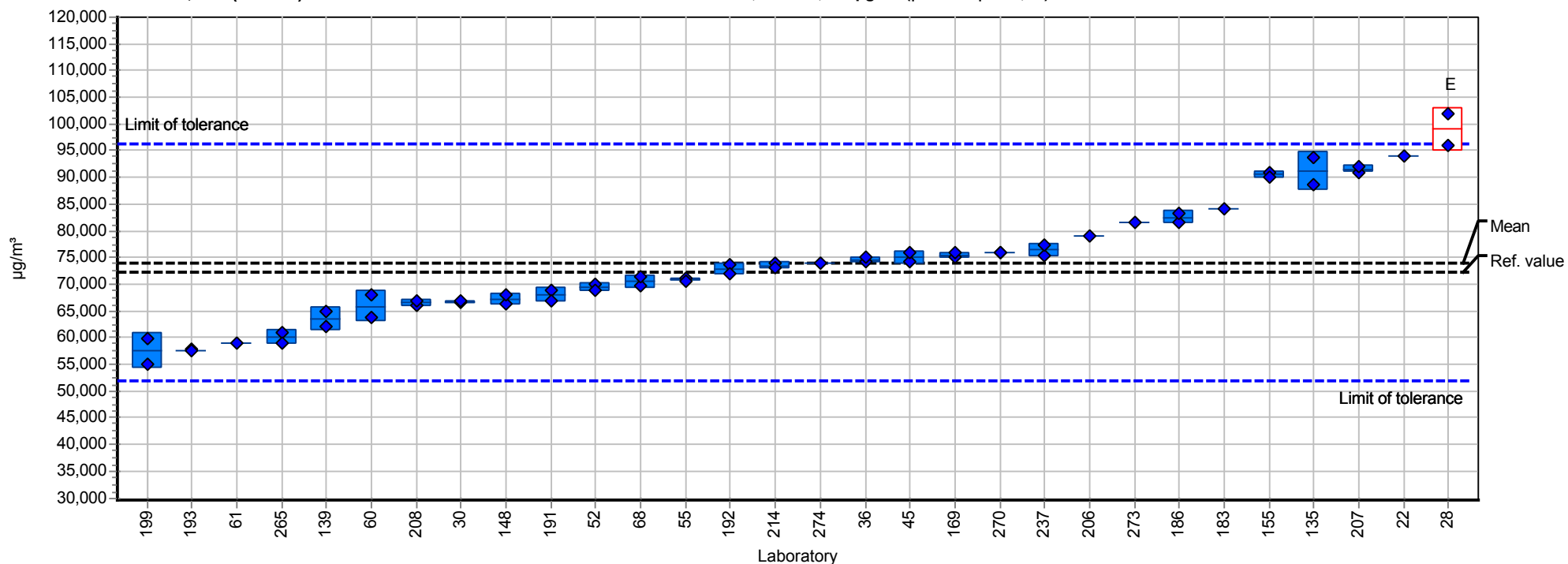
Sample chart of Z-Scores

Sample 1



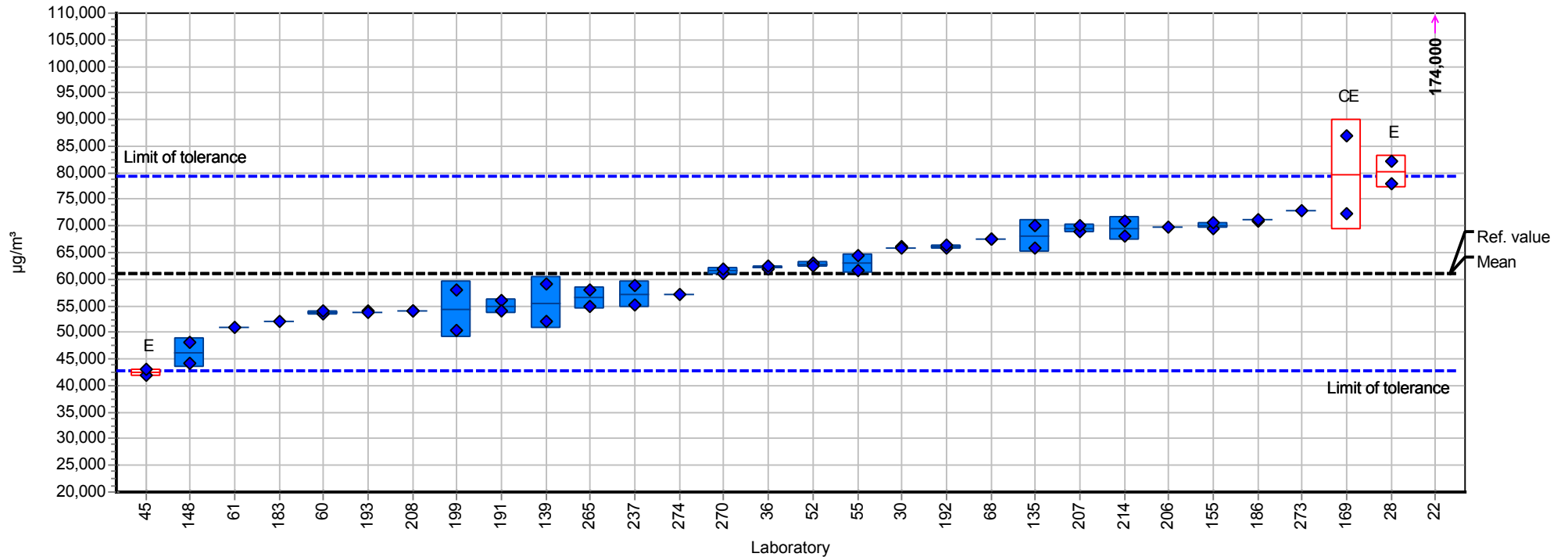
Summary results

Measurand:	n-Butyl acetate	Mean:	74,001 µg/m³
Sample:	2	Reproducibility s.d.:	11,037 µg/m³
Method:	ISO 5725-2	Relative reproducibility s.d.:	14,91%
No. of laboratories:	30	Reference value:	72,350 µg/m³
Relative target s.d.:	15,00% (Limited)	Range of tolerance:	51,800 - 96,201 µg/m³ (Z-Score ≤ 2,00)



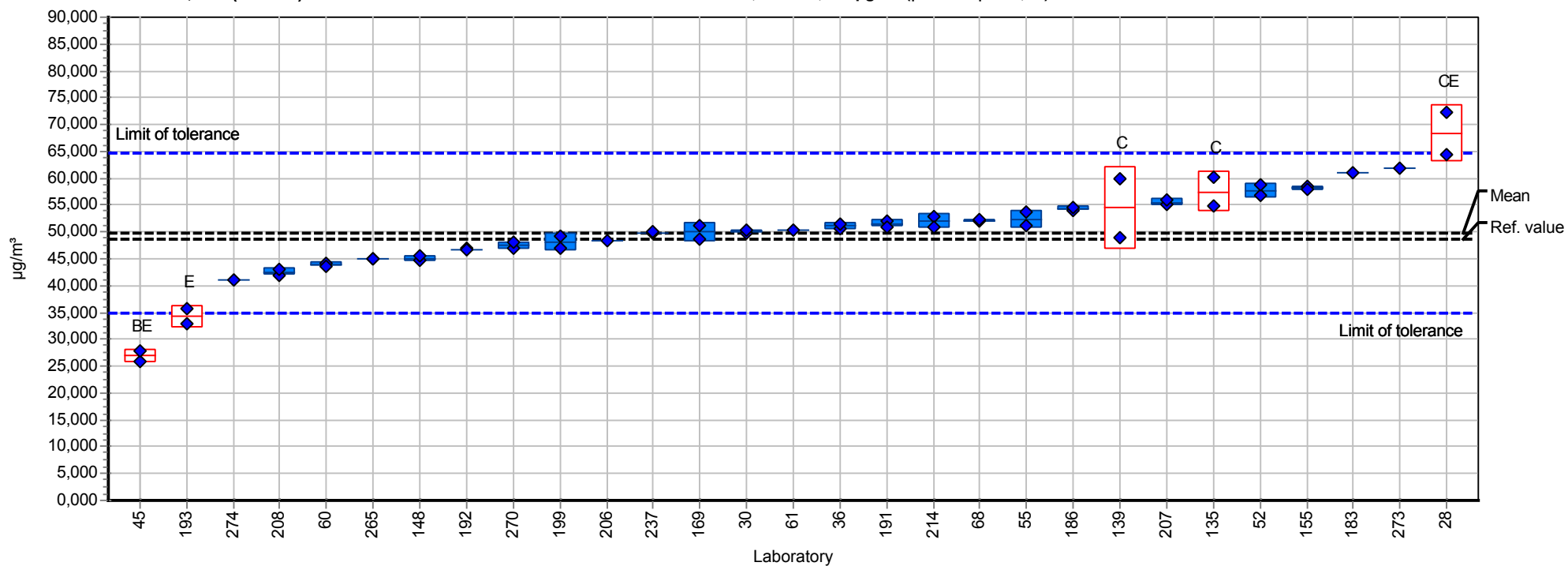
Summary results

Measurand:	n-Heptane	Mean:	61,047 µg/m³
Sample:	2	Reproducibility s.d.:	8,962 µg/m³
Method:	ISO 5725-2	Relative reproducibility s.d.:	14,68%
No. of laboratories:	28	Reference value:	61,060 µg/m³
Relative target s.d.:	15,00% (Limited)	Range of tolerance:	42,733 - 79,361 µg/m³ (Z-Score <= 2,00)



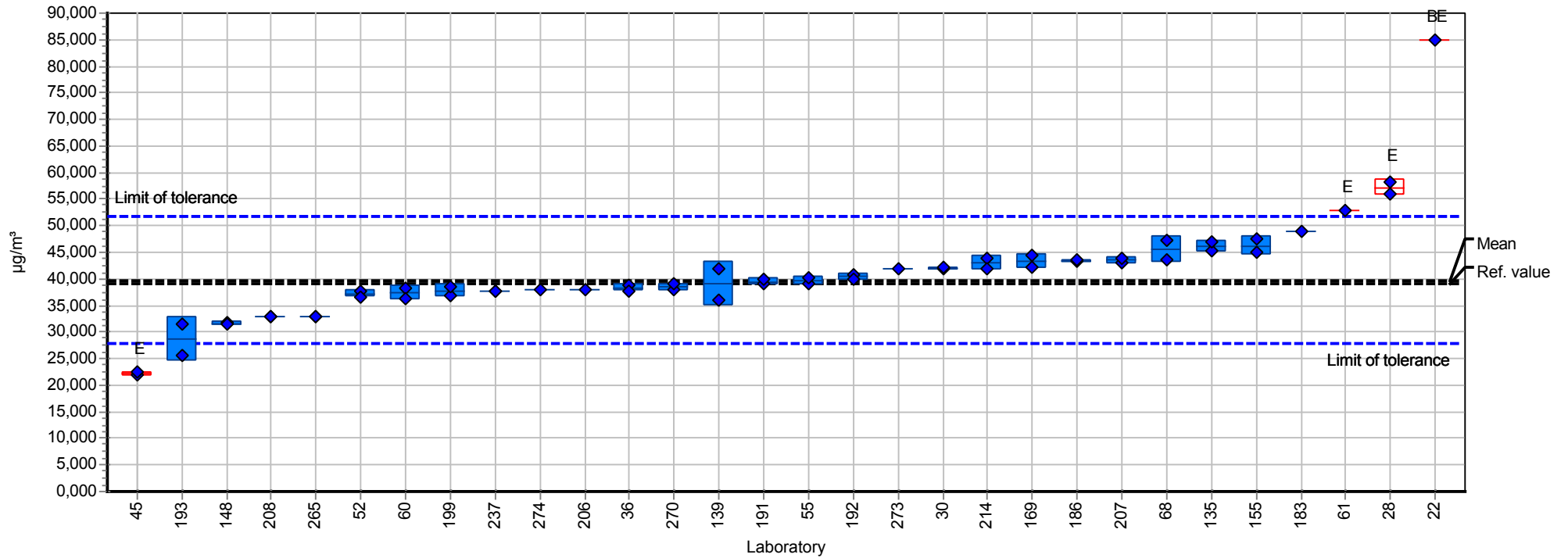
Summary results

Measurand:	Toluene	Mean:	49,742 µg/m³
Sample:	2	Reproducibility s.d.:	6,047 µg/m³
Method:	ISO 5725-2	Relative reproducibility s.d.:	12,16%
No. of laboratories:	25	Reference value:	48,760 µg/m³
Relative target s.d.:	15,00% (Limited)	Range of tolerance:	34,820 - 64,665 µg/m³ (Z-Score ≤ 2,00)



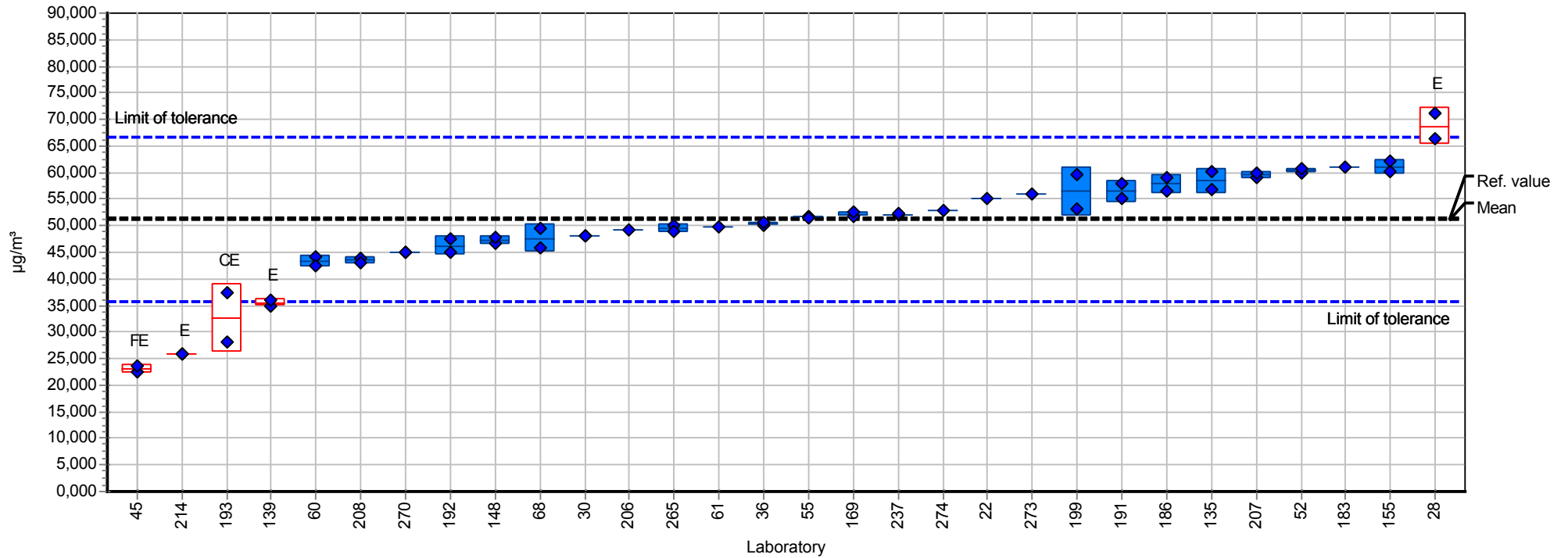
Summary results

Measurand:	n-Octane	Mean:	39,772 µg/m ³
Sample:	2	Reproducibility s.d.:	7,017 µg/m ³
Method:	ISO 5725-2	Relative reproducibility s.d.:	17,64%
No. of laboratories:	29	Reference value:	39,000 µg/m ³
Relative target s.d.:	15,00% (Limited)	Range of tolerance:	27,841 - 51,704 µg/m ³ (Z-Score <= 2,00)



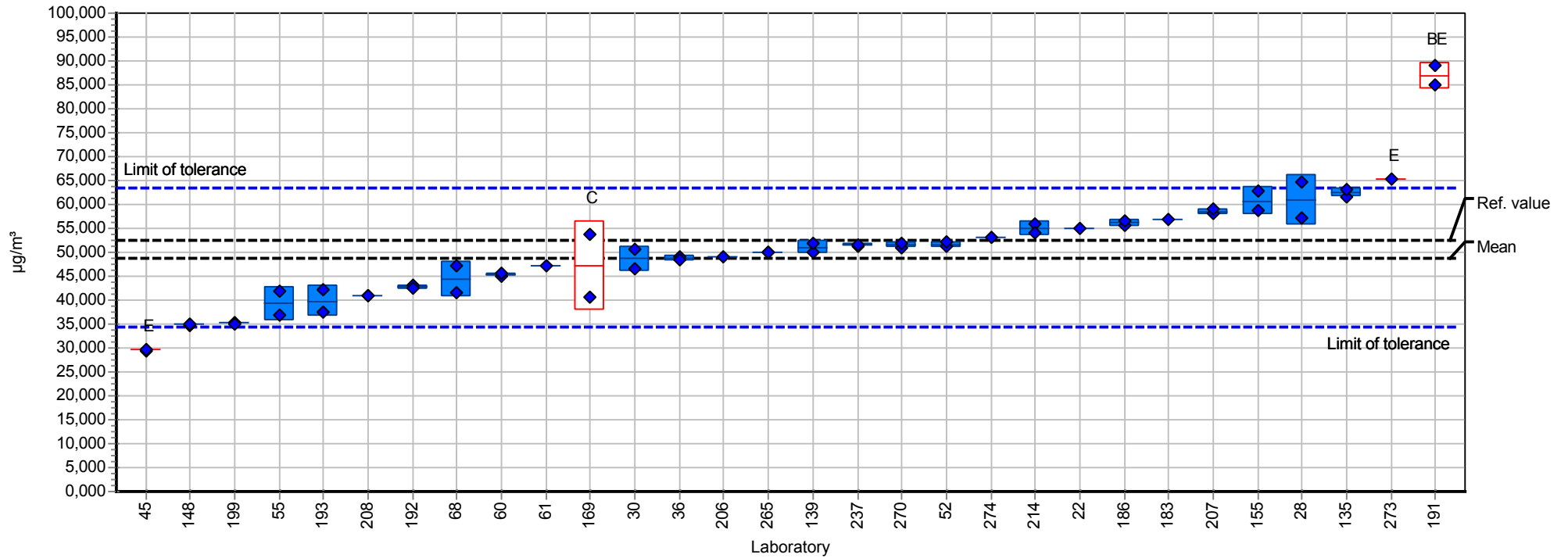
Summary results

Measurand:	p-Xylene	Mean:	51,175 µg/m ³
Sample:	2	Reproducibility s.d.:	8,930 µg/m ³
Method:	ISO 5725-2	Relative reproducibility s.d.:	17,45%
No. of laboratories:	28	Reference value:	51,480 µg/m ³
Relative target s.d.:	15,00% (Limited)	Range of tolerance:	35,822 - 66,527 µg/m ³ (Z-Score <= 2,00)



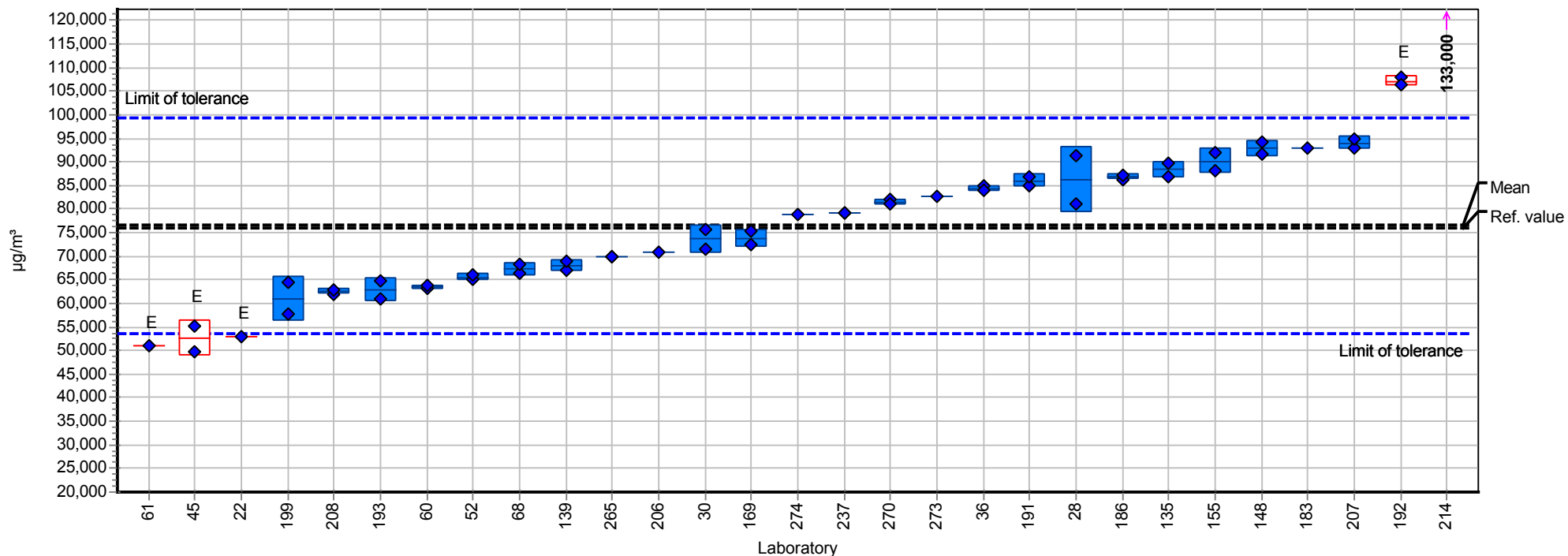
Summary results

Measurand:	n-Dodecane	Mean:	48,884 µg/m ³
Sample:	2	Reproducibility s.d.:	9,066 µg/m ³
Method:	ISO 5725-2	Relative reproducibility s.d.:	18,55%
No. of laboratories:	28	Reference value:	52,540 µg/m ³
Relative target s.d.:	15,00% (Limited)	Range of tolerance:	34,219 - 63,549 µg/m ³ (Z-Score ≤ 2,00)



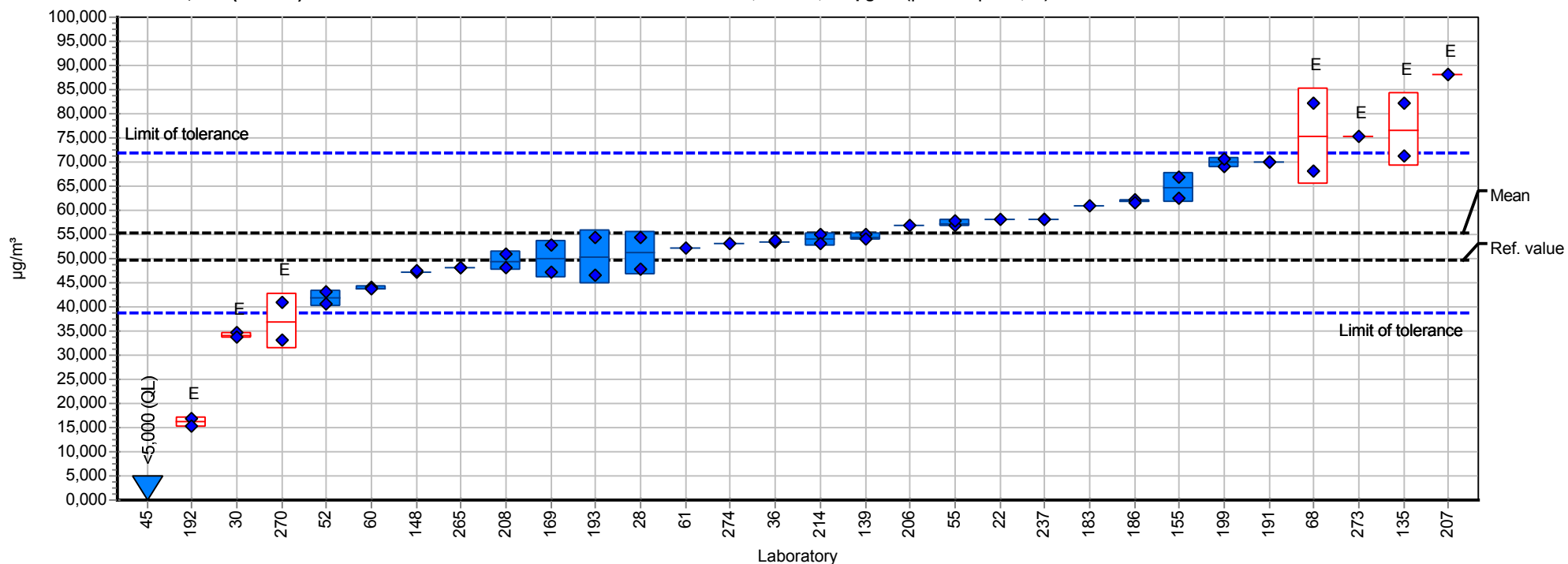
Summary results

Measurand:	Decamethylcyclopentasiloxane	Mean:	76,469 µg/m³
Sample:	2	Reproducibility s.d.:	14,075 µg/m³
Method:	ISO 5725-2	Relative reproducibility s.d.:	18,41%
No. of laboratories:	28	Reference value:	76,010 µg/m³
Relative target s.d.:	15,00% (Limited)	Range of tolerance:	53,529 - 99,410 µg/m³ (Z-Score <= 2,00)



Summary results

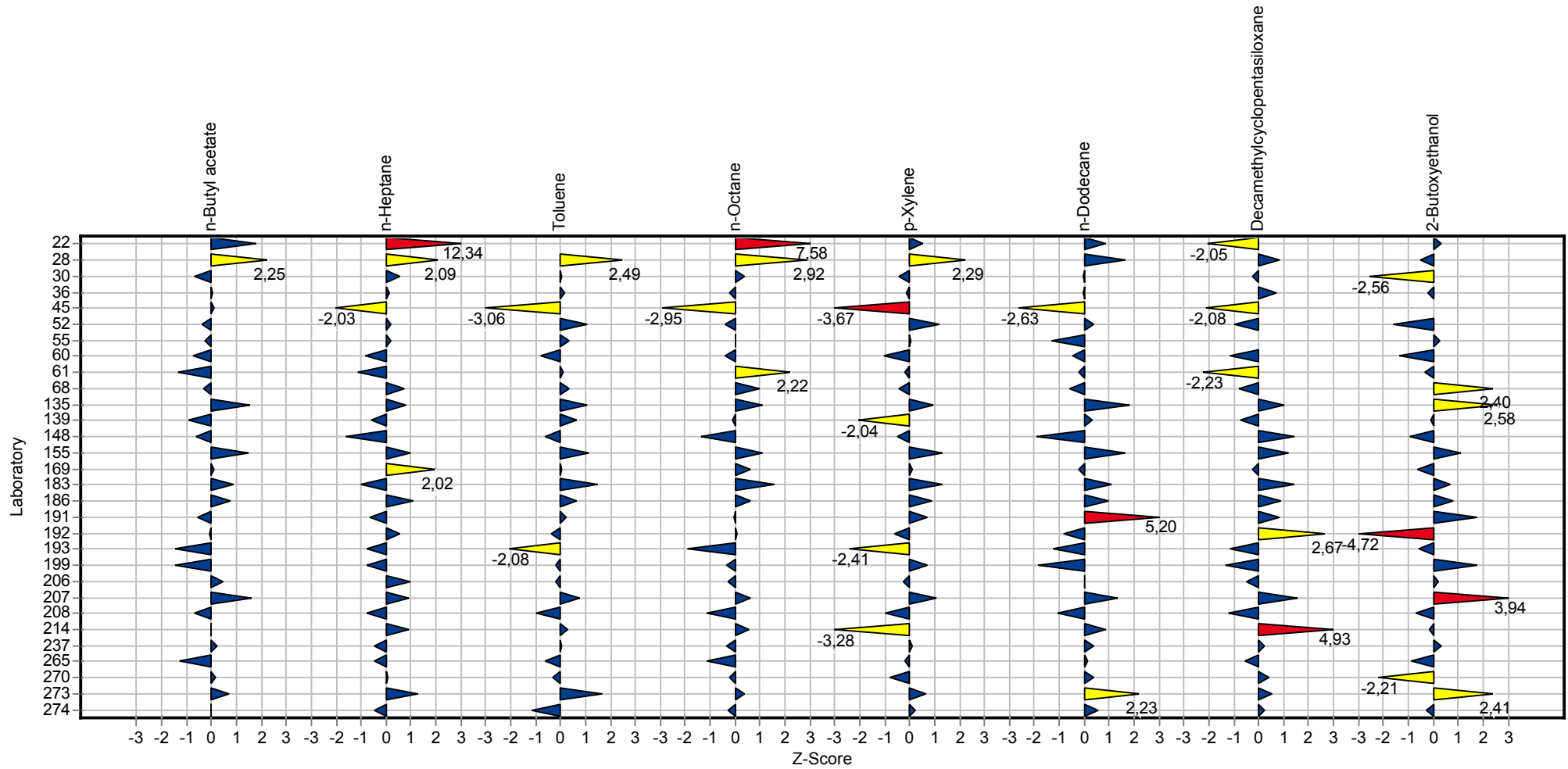
Measurand:	2-Butoxyethanol	Mean:	55,303 µg/m³
Sample:	2	Reproducibility s.d.:	11,623 µg/m³
Method:	ISO 5725-2	Relative reproducibility s.d.:	21,02%
No. of laboratories:	27	Reference value:	49,650 µg/m³
Relative target s.d.:	15,00% (Limited)	Range of tolerance:	38,712 - 71,894 µg/m³ (Z-Score ≤ 2,00)



Sample chart of Z-Scores

Sample 2

Measurand



Questions and Answers

Participant	Kind of tube	Analytical method	thermodesorber
22	Tenax TA	GC/MS	Markes Unity - Thermodesorber mit Autosampler Ultra TD
28	Perkin Elmer	no	Gerstel TDS 3
30	Tenax TA	ISO 16000-6	TD 650 Perkin Elmer
36	Tenax TA + Glass wool	ISO 16000-6	TD 650 Perkin Elmer
45	Makes with TENAX	yes	ATD TMX PERKIN ELMER
52	Tenax TA	DIN EN ISO 16017-1	Perkin Elmer ATD TurboMatrix 650
55	TENAX-TA	In house method	MARKES TD100
60	tenax	yes	Markes
61	Tenax TA	Ja	Perkin Elmer TurboMatrix ATD
68	Tenax TA	Nein	Turbomatrix ATD von PerkinElmer
135	Tenax TA	ja	Perkin Elmer TurboMatrix 650
139	Tenax TA	nein	Gerstel
148	Tenax TA	nein	Perkin Elmer Turbo Matrix
155	Gerstel Tenax TA	DIN ISO 16000-6 und DIN EN ISO 16017-1	Gerstel TDS 2 mit Gerstel TDS A und KAS 4
169	Tenax TA	ja	TDS2 (Fa. Gerstel)
183	Tenax TA	no (ISO 16000-6)	Markes TD-100
186	Tenax TA	Yes	TurboMatrix 650
191	Tenax TA	yes	TDS Gerstel
192	Tenax TA	ISO/DIS 16000-6	TurboMatrix ATD(PerkinElmer Inc.)
193	Tenax TA		TurboMatrix 650 -PerkinElmer
199	Tenax TA	nein	UNITY Series2 von MARKES
206	Tenax TA Camsco	Thermodesorption, GC-MS	Turbomatrix ATD
207	Tenax	Ja	Markes Unity TD 100
208	TenaxTA/Carbograph 5 TD	In house method, modified from ISO 16006.2	Markes Unity2 + Ultra
214	Tenax TA	JA	Unity / Ultra von Fa. Markes
237	Tenax TA 60/80	Inhouse	Turbomatrix Perkin Elmer
265	Tenax TA	DIN ISO 16000-6	Schimadzu TD 20
270	Tenax TA	ja, in Anlehnung	Shimadzu TD 20
273	Tenax TA	ISO16000-6	Direct desorption

Round-robin test VOC 3/2014

Participant	Desorption temperature	Desorption flow	Desorption time
22	280 °C	10ml/min	5 min
28	280	100 ml/min	12 mins
30	260°C	50 mL/min	15 min
36	260°C	50 mL/min	15 min
45	280°C	20 mL/min	30 min
52	280 °C	20 mL/min	20 min.
55	300°C	30 ml/min	10 min
60	295	100	5
61	300°C	10 ml/min	20 min
68	340°C	50 ml/min	20 min
135	280°C	29	15
139	250°C		3
148	300 °C	70 cm3/ min	15 min
155	15 °C 1 min 40 °C/min 305 °C 8 min	40 ml/min	15 °C 1 min 40 °C/min 305 °C 8 min
169	280°C	100	5
183	280 C	50 ml/min	6 min
186	280	50 mL/min	20 min
191	260°C		10 min
192	260Ž	30ml/min	10min
193	250°C	50ml/min	15min
199	250 °C	35 mL/min	6min
206	270° C	50 ml	3 min
207	300	20	8
208	290	50mL/min	10 min
214	300°C	5	10
237	300 °C	30 mL/ min	10 min
265	250°C	60ml/min	28
270	280	60	15
273	280	35	20

Participant	cyro trap	Carrier gas	Flow rate
22	5 min bei 3°C, dann 300°C	Helium	2,9 ml/min
28	-30°C to 300°C	Helium	1.5 ml/min
30	Tenax TA / 280°C	He	1 mL/min

Round-robin test VOC 3/2014

Participant	cyro trap	Carrier gas	Flow rate
36	Tenax TA / 280°C	He	1 mL/min
45	-30°C / 300°C	Helium	20,5 Psi
52	-30 °C, 280 °C	Helium	4-5 mL/min.
55	10°C 350°C	He	1 ml/min
60	-10	helium	1
61	-30°C - 300°C	Helium	1 ml/min
68	-20°C, 340°C	Helium	15 ml/min
135	-20°C -> 310°C	Helium	1,5
139	-90°C, 270°C	He	0,9
148	-30 °C (0 min) 40 °C/min 320°C	Helium	26 psi
155	minus 150 °C 1 min 12 °C/sec 305 °C 8 min	Helium Qualität ECD	1 ml/min const. Flow
169	-100/280	Helium	1,0
183	from +20 C to +280 C	helium	1.0 ml/min
186	-30°C to 280°C at 45°C/sec	Helium	2 mL/min
191	CIS Gerstel; 12°C/sec	Helium	
192	Cryo trap at 5Ž and desorb at +280Ž	helium	3ml/min
193	-40°C / 280°C	Helium 6.0	
199	-10 °C / 300 °C	Helium	0,7 mL/min
206	-30°C	Helium	1 ml/min
207	-25	Helium	1,2
208	-10 to 300	He	1 mL/min
214	0°C 300°C	Helium	1
237	von minus 20 °C auf + 290 °C	Helium	ca. 0,5 mL/ min
265	-13°C; +250°C	Helium	27,1ml/min
270	-18/280	TD: Stickstoff,GC: Helium	
273	Cooling temperature during desorption: -20 , heating temperature: 310	Helium	1

Participant	Analytical column	Detector
22	Phenomen ZB-5MSi - 5% Phenyl - 95 % Dimethylpolysiloxane	Triple- Quat MS
28	Varian VF5MS 30m*0.25mm*1µm	Mass spectrometry
30	Restek Rxi 5 ms 40 m x 0,18 mm id x 0,18 µm df	Agilent 7890B with MS 5977A
36	Restek Rxi 5ms 60 m x 0,25 mm id x 0,25 µm df	Agilent GC 7890A with MS 5975C
45	HP - Ultra 2	MS Clarus 500 + FID PERKIN ELMER
52	Zebron ZB 1MS, 60m x 0,32mm x 1µm	FID + MSD

Round-robin test VOC 3/2014

Participant	Analytical column	Detector
55	Rxi 5 Sil MS , 60 m , 0.25 mm , df=1.0 µm	DSQ
60	HP-1MS	MS
61	DB 624 30m, 0,25mm, 0,1µm	Massenspektrometer
68	Vocol von Supelco	MS
135	RTX-200	MS
139	HP5MS 60mx250µmx0,25µm	MS
148	RCI 5MSI (60m x 0,25mm x 0,25µm	MS
155	Agilent HP 5 ms 60m x 0,25mm x 0,25µm	Agilent MSD 5975
169	DB5-MS	MS
183	HP-5MS	MSD
186	Perkin Elite 5MS	FID for quantification MS for Identification
191	ULTRA II	MS
192	HP-VOC(60m length, 0.32mmI.D., 1.8fEm film)	MSD
193		MS (Clarus SQ8T -Perkinelmer)
199	DB-5.625MS	5975C GC-MS-Triple-Axis
206	Agilent VF-5 ms	Leco Pegasus
207	DB 5	MS
208	HP-1MS	MSD
214	Agilent CP 9013 Phase VF-5ms ID 0,25 mm / Länge 30 m Df 0,25 µm + 10 m EZ Guard	MS
237	Varian Xms VF	MSD
265	Agilent VF-5ms 60m x 0,32mm (1µm)	MS
270	Restek RXI 5 Sil MS incl Guard	Massenspektrometer
273	Rtx 200	5975C with triple axis

Participant	Data evaluation
22	Identifikation über Fragmentationen und RT - Vergleich mit Datenbanken; Quantifizierung: substanzspezifische Kalibration mit internem Std Cyclodekan;
28	Specific calibration
30	Identification and quantification by MS
36	20.06.14 and 25.06.14
45	quantification with TIC spectrum and specific factor (not SIR mode) + identification with NIST
52	Identifikation über RT und Masse, Quantifizierung über FID
55	12 juni 2014
60	target
61	Externe Quantifizierung, Qualifizierung über Scan

Round-robin test VOC 3/2014

Participant	Data evaluation
68	Identifikation mit MS, Quantifizierung mit entspr. Berechnung in einem Excelfile
135	externer Standard, Massenspektren-Abgleich
139	Ident. mit MS, quant. über ext. Standard
148	Kalibration + Standard
155	substanzspezifisch
169	externe Kalibrierung
183	with actual response factor for each compound
186	External Calibration
191	TIC quantification, MS identification
192	2-Butoxyethanol and Decamethylcyclopentasiloxane were calculated by using toluene(TIC) response factor, and others were calculated by using their individual response.
193	quantifiziert über Kalibration - identifiziert über NIST-Datenbank
199	Quantifizierung: Kalibrierung von Standards der Einzelsubstanzen von 5 - 250 µg/m³; Korrektur über interne Standards (Toluol-d8, o-Xylol-d10, Dodecan-d26, Naphthalin-d8) / Identifizierung: GC-MS + Standards der einzelnen Substanzen
206	dto.
207	EIC Originalreferenzen, eigene + kommerzielle Bibliotheken
208	pure compounds for identification and quantitation
214	manuelle Integration, Identifizierung über MS
237	04.06.2014
265	Quantifizierung über Eichung
270	Interne Standards mit RRF zu externen Standards, externe Standards
273	scan mode and library search

Participant	Recovery rate	Date of analysis
22		27.06.2014
28	no	03/06/2014
30	> 95%	05.06.2014
36	> 95%	Identification by MS and quantification by FID
45	No	25/06/2014
52	ja	05.06.14
55		11 juni 2014
60	no	03/06/2014
61	Ja	30.06.2014
68	Nein	10./11.6.2014
135	nicht erforderlich	03.06.2014

Round-robin test VOC 3/2014

Participant	Recovery rate	Date of analysis
139	nein	24. KW
148	nein	30.06/01.07
155	entfällt	05.06.2014
169		30.05.2014
183	no	June 19-23
186	No	20/06/2014
191		06/06/2014
192	No	10-June-14
193	nein	18/06/2014
199	nein	24.06.2014
206		11.6.14
207		4.06.2014
208		28th June 2014
214	nein	02.06.2014
237		04.06.2014
265	nein	05.06.2014
270	ja	13.06.2014
273	No	2014-6-9

