IFA
Institut für Arbeitsschutz der
Deutschen Gesetzlichen Unfallversicherung

Round-robin tests for

in-house measuring laboratories

Institut für Arbeitsschutz der Deutschen Gesetzlichen Unfallversicherung (IFA)
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Results and Evaluation

Round-robin test

Organic substances with thermodesorption (VOC)

26-27 April 2016

Summary of laboratory means

Sample 1

	n-Butyl acetate	Z score	n-Heptane	Z score	Toluene	Z score	n-Octane	Z score	p-Xylene	Z score	Ethylbenzene	Z score
Unit	µg/m³		µg/m³		µg/m³		µg/m³		µg/m³		µg/m³	
2	73,19	-1,71	83,98	1,66	71,31	-1,16	100,48	0,58	71,34	-0,80	43,83	-1,39
40	91,00	0,30	68,50	-0,49	87,50	0,85	98,00	0,32	81,50	0,51	54,50	0,70
46	85,00	-0,37	66,50	-0,77	73,00	-0,95	90,50	-0,47	76,50	-0,14	50,50	-0,08
95	82,25	-0,69	134,40	8,66 BE	117,50	4,57 BE	129,00	3,58 BE	70,60	-0,90	51,55	0,12
101	93,17	0,55	69,76	-0,31	81,18	0,07	95,79	0,09	79,89	0,30	52,51	0,31
135	95,45	0,81	66,70	-0,74	79,30	-0,17	93,90	-0,11	79,95	0,31	51,75	0,16
158	94,10	0,66	67,40	-0,64	79,60	-0,13	93,80	-0,12	79,10	0,20	51,70	0,15
199	69,00	-2,19 E	71,00	-0,14	78,00	-0,33	92,00	-0,31	65,00	-1,62	40,00	-2,14 E
215	82,40	-0,67	69,00	-0,42	73,20	-0,92	80,80	-1,49	72,65	-0,64	47,45	-0,68
230	101,50	1,49	78,50	0,90	95,00	1,78	101,50	0,69	87,50	1,28	55,50	0,90
263	100,03	1,33	74,84	0,39	86,72	0,75	101,31	0,67	84,96	0,95	56,50	1,10
–	–	– –	–	– –	–	– –	–	– –	–	– –	–	– –
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	11		11		11		11		11		11	
Mean	88,31		72,01		80,64		94,97		77,58		50,91	
Reproducibility s.d.	10,60		6,36		8,43		7,02		6,89		4,93	
Rel. reproducibility s.d.	12,01 %		8,83 %		10,45 %		7,40 %		8,89 %		9,69 %	
Reference value	89,20		68,60		79,30		97,60		81,40		53,60	
Target s.d.	8,83		7,20		8,06		9,50		7,76		5,09	
Rel. target s.d.	10,00 %		10,00 %		10,00 %		10,00 %		10,00 %		10,00 %	
Lower limit of tolerance	70,65		57,61		64,51		75,98		62,06		40,73	
Upper limit of tolerance	105,97		86,41		96,77		113,97		93,09		61,10	
Type B outliers			1		1		1					
Type F outliers												
No. of laboratories after elimination of outliers type A-D and F (without laboratories that only gave states	11		10		10		10		11		11	

	n-Butyl acetate	Z score	n-Heptane	Z score	Toluene	Z score	n-Octane	Z score	p-Xylene	Z score	Ethylbenzene	Z score

but no measured values)

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

	1,2,4-Trimethylbenzene	Z score		4-Methyl-2-Pentanone	Z score		Cumene	Z score	
Unit	µg/m³			µg/m³			µg/m³		
2	33,35	-3,85	FE	75,93	-0,53		38,39	-2,41	E
40	54,00	-0,04		83,00	0,36		54,50	0,78	
46	51,50	-0,50		73,50	-0,83		51,00	0,09	
95				119,55	4,92	BE	38,40	-2,40	E
101	54,87	0,12		81,69	0,19		53,53	0,59	
135	58,85	0,85		80,95	0,10		56,45	1,17	
158	53,50	-0,13		80,00	-0,02		57,80	1,43	
199	38,00	-2,99	E	69,00	-1,39		45,00	-1,10	
215	47,80	-1,18		73,05	-0,89		47,50	-0,60	
230	62,50	1,53		90,50	1,29		56,50	1,18	
263	58,80	0,84		89,02	1,11		59,36	1,74	
–	–	– –		–	– –		–	– –	
Method	ISO 5725-2			ISO 5725-2			ISO 5725-2		
Assessment	|Z|<=2,00			|Z|<=2,00			|Z|<=2,00		
No. of laboratories that submitted results	10			11			11		
Mean	54,22			80,15			50,55		
Reproducibility s.d.	6,77			7,18			7,95		

	1,2,4-Trimethylbenzene	Z score	4-Methyl-2-Pentanone	Z score	Cumene	Z score
Rel. reproducibility s.d.	12,48 %		8,95 %		15,73 %	
Reference value	51,70		79,30		50,80	
Target s.d.	5,42		8,02		5,06	
Rel. target s.d.	10,00 %		10,00 %		10,00 %	
Lower limit of tolerance	43,37		64,12		40,44	
Upper limit of tolerance	65,06		96,18		60,66	
Type B outliers			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)	9		10		11	

Summary of laboratory means

Sample 2

	n-Butyl acetate	Z score	n-Heptane	Z score	Toluene	Z score	n-Octane	Z score	p-Xylene	Z score	Ethylbenzene	Z score
Unit	µg/m³		µg/m³		µg/m³		µg/m³		µg/m³		µg/m³	
2	87,41	-1,57	108,13	1,80	56,36	-0,60	91,19	0,61	101,77	-0,71	87,50	0,66
40	56,00	-4,60 FE	48,00	-4,76 FE	34,00	-4,33 FE	48,50	-4,36 BE	62,50	-4,30 BE	48,00	-4,15 BE
46	105,00	0,12	86,00	-0,61	57,00	-0,49	83,50	-0,28	110,00	0,04	80,00	-0,26
95	81,70	-2,12 CE	164,45	7,95 BE	80,95	3,50 FE	105,30	2,26 BE	83,25	-2,40 CE	72,85	-1,13
101	112,82	0,88	89,32	-0,25	60,72	0,13	87,95	0,24	112,36	0,25	85,53	0,42
135	112,85	0,88	82,65	-0,98	57,90	-0,34	83,25	-0,31	110,10	0,05	81,65	-0,06
158	113,20	0,91	86,80	-0,53	58,80	-0,19	84,80	-0,13	109,50	-0,01	81,90	-0,02
199	87,00	-1,61	86,00	-0,61	58,00	-0,32	84,00	-0,22	101,00	-0,78	71,00	-1,35
215	80,75	-2,22 E	91,75	0,01	56,15	-0,63	77,30	-1,00	107,75	-0,17	80,00	-0,26
230	118,00	1,38	96,00	0,48	69,50	1,59	90,00	0,47	115,50	0,54	87,50	0,66
263	117,45	1,32	91,51	-0,01	63,93	0,66	90,80	0,57	115,40	0,53	89,16	0,86
–	–	– –	–	– –	–	– –	–	– –	–	– –	–	– –
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	11		11		11		11		11		11	
Mean	103,73		91,61		59,95		85,92		109,59		82,10	
Reproducibility s.d.	15,17		8,29		4,95		5,10		5,44		6,73	
Rel. reproducibility s.d.	14,62 %		9,05 %		8,25 %		5,94 %		4,96 %		8,20 %	
Reference value	109,50		88,10		58,70		81,30		116,40		87,00	
Target s.d.	10,37		9,16		5,99		8,59		10,96		8,21	
Rel. target s.d.	10,00 %		10,00 %		10,00 %		10,00 %		10,00 %		10,00 %	
Lower limit of tolerance	82,98		73,29		47,96		68,74		87,67		65,68	
Upper limit of tolerance	124,47		109,94		71,94		103,11		131,51		98,52	
Type B outliers			1				2		1		1	
Type C outliers	1								1			
Type F outliers	1		1		2							
No. of laboratories after elimination	9		9		9		9		9		10	

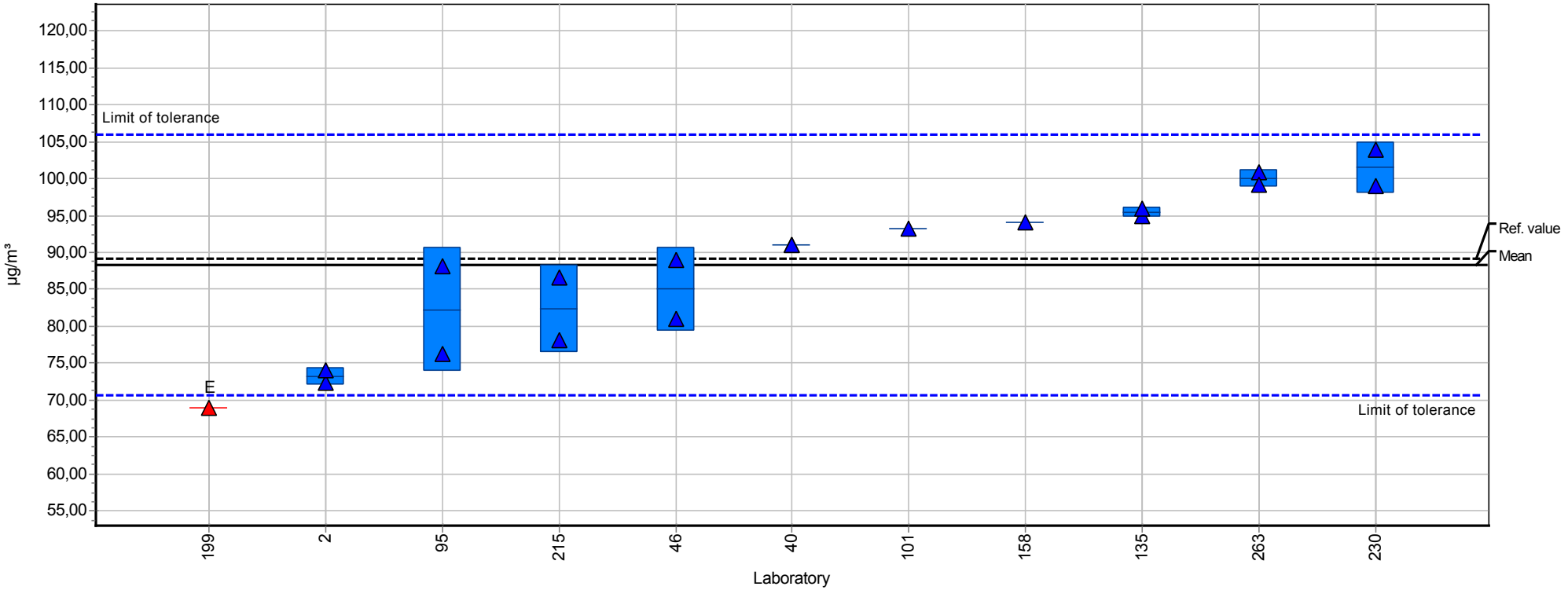
	n-Butyl acetate Z score	n-Heptane Z score	Toluene Z score	n-Octane Z score	p-Xylene Z score	Ethylbenzene Z score
of outliers type A-D and F (without laboratories that only gave states but no measured values)						
Explanation of outlier types						
A: Single outlier	Grubbs					
B: Differing laboratory 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					

	1,2,4-Trimethylbenzene	Z score		4-Methyl-2-Pentanone	Z score		Cumene	Z score	
Unit	µg/m³			µg/m³			µg/m³		
2	40,69	-2,57	E	92,95	-0,54		73,27	-2,05	E
40	30,50	-4,43	FE	54,50	-4,46	FE	52,00	-4,36	FE
46	56,00	0,22		93,00	-0,54		91,00	-0,12	
95				138,55	4,09	FE	55,20	-4,01	DE
101	58,56	0,69		101,83	0,36		95,05	0,32	
135	60,45	1,03		98,50	0,02		97,40	0,57	
158	55,30	0,09		100,00	0,17		100,00	0,85	
199	42,00	-2,33	E	93,00	-0,54		87,00	-0,56	
215	52,45	-0,43		88,30	-1,02		88,15	-0,43	
230	63,00	1,50		109,00	1,09		100,00	0,85	
263	60,44	1,03		108,10	1,00		100,19	0,87	
–	–	– –		–	– –		–	– –	
Method	ISO 5725-2			ISO 5725-2			ISO 5725-2		
Assessment	|Z|<=2,00			|Z|<=2,00			|Z|<=2,00		
No. of laboratories that submitted results	10			11			11		
Mean	54,79			98,30			92,14		

	1,2,4-Trimethylbenzene	Z score	4-Methyl-2-Pentanone	Z score	Cumene	Z score
Reproducibility s.d.	8,10		8,26		9,60	
Rel. reproducibility s.d.	14,79 %		8,40 %		10,42 %	
Reference value	55,30		100,30		91,10	
Target s.d.	5,48		9,83		9,21	
Rel. target s.d.	10,00 %		10,00 %		10,00 %	
Lower limit of tolerance	43,84		78,64		73,71	
Upper limit of tolerance	65,75		117,96		110,57	
Type F outliers	1		2		1	
No. of laboratories after elimination of outliers type A-D and F (without laboratories that only gave states but no measured values)	9		9		9	

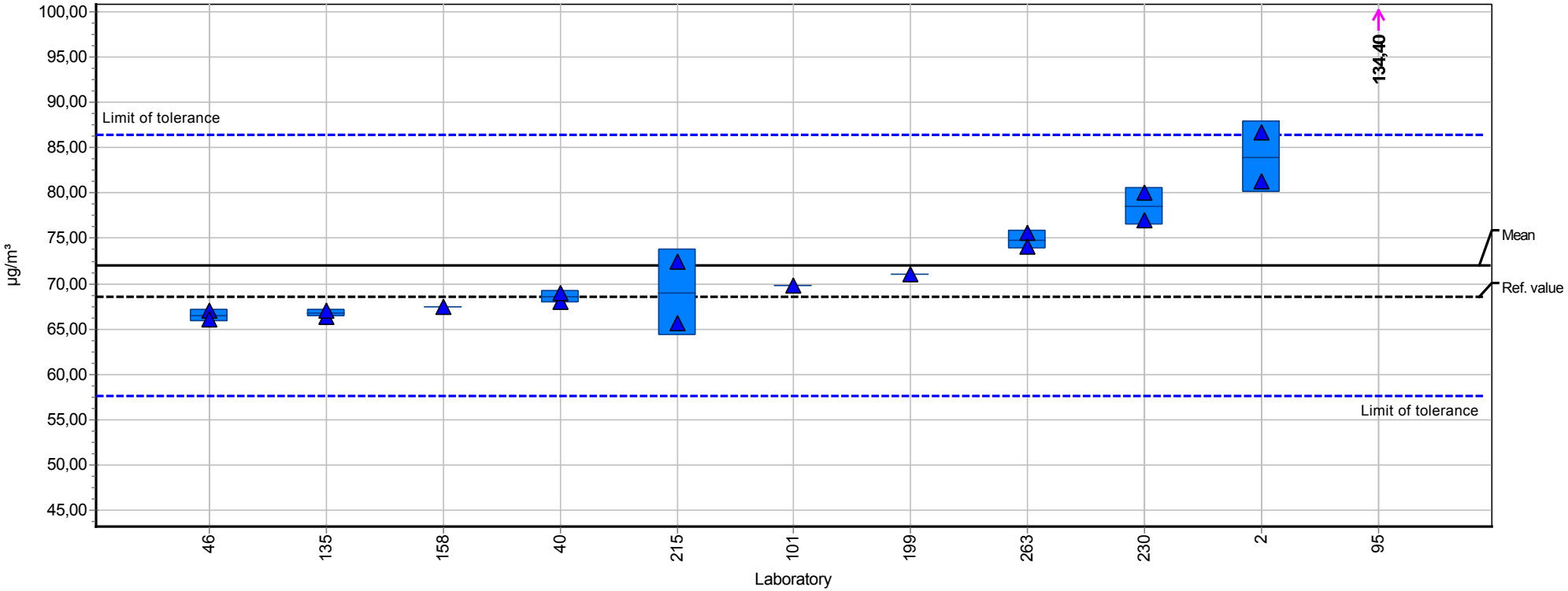
Summary results

Measurand:	**n-Butyl acetate**	**Mean:**	**88,31 µg/m³**
Sample:	**1**	**Reproducibility s.d.:**	**10,60 µg/m³**
Method:	**ISO 5725-2**	**Relative reproducibility s.d.:**	**12,01%**
Relative target s.d.:	**10,00% (Limited)**	**Reference value:**	**89,20 µg/m³**
No. of laboratories:	**11**	**Range of tolerance:**	**70,65 - 105,97 µg/m³ (|Z-Score| <= 2,00)**



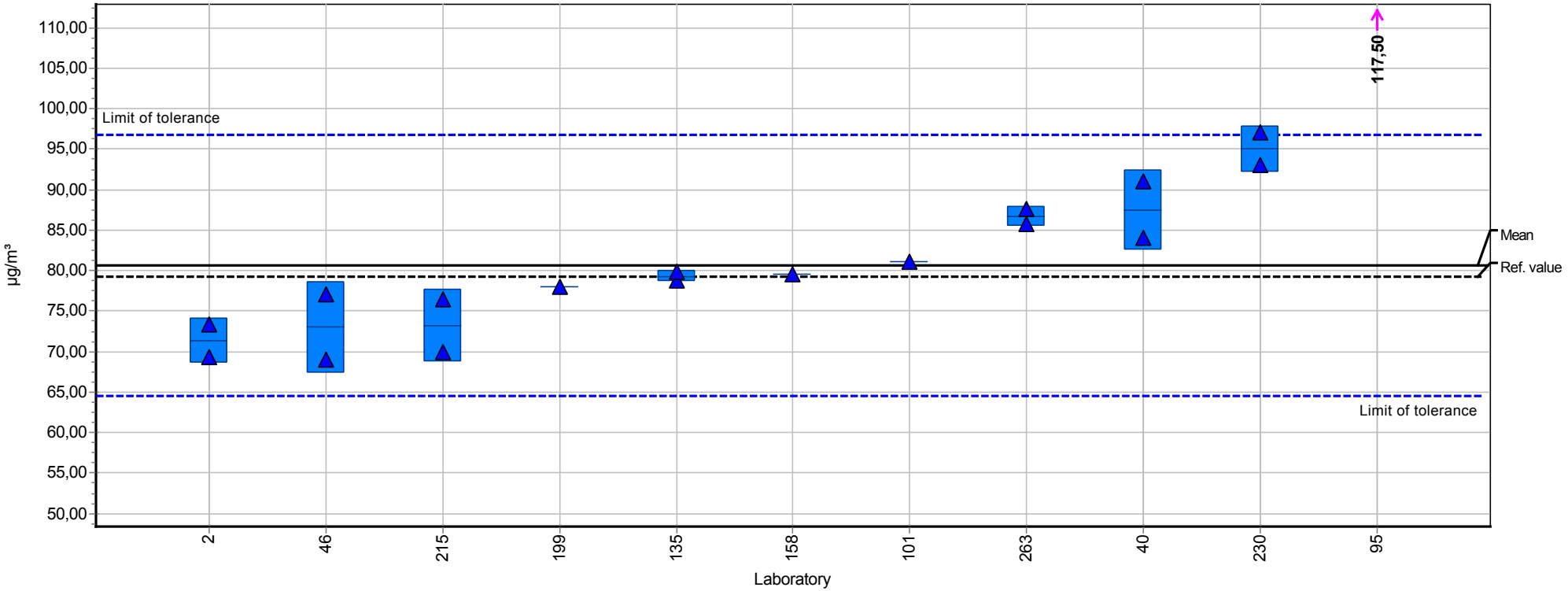
Summary results

Measurand:	**n-Heptane**	**Mean:**	**72,01 µg/m³**
Sample:	**1**	**Reproducibility s.d.:**	**6,36 µg/m³**
Method:	**ISO 5725-2**	**Relative reproducibility s.d.:**	**8,83%**
Relative target s.d.:	**10,00% (Limited)**	**Reference value:**	**68,60 µg/m³**
No. of laboratories:	**10**	**Range of tolerance:**	**57,61 - 86,41 µg/m³ (|Z-Score| <= 2,00)**



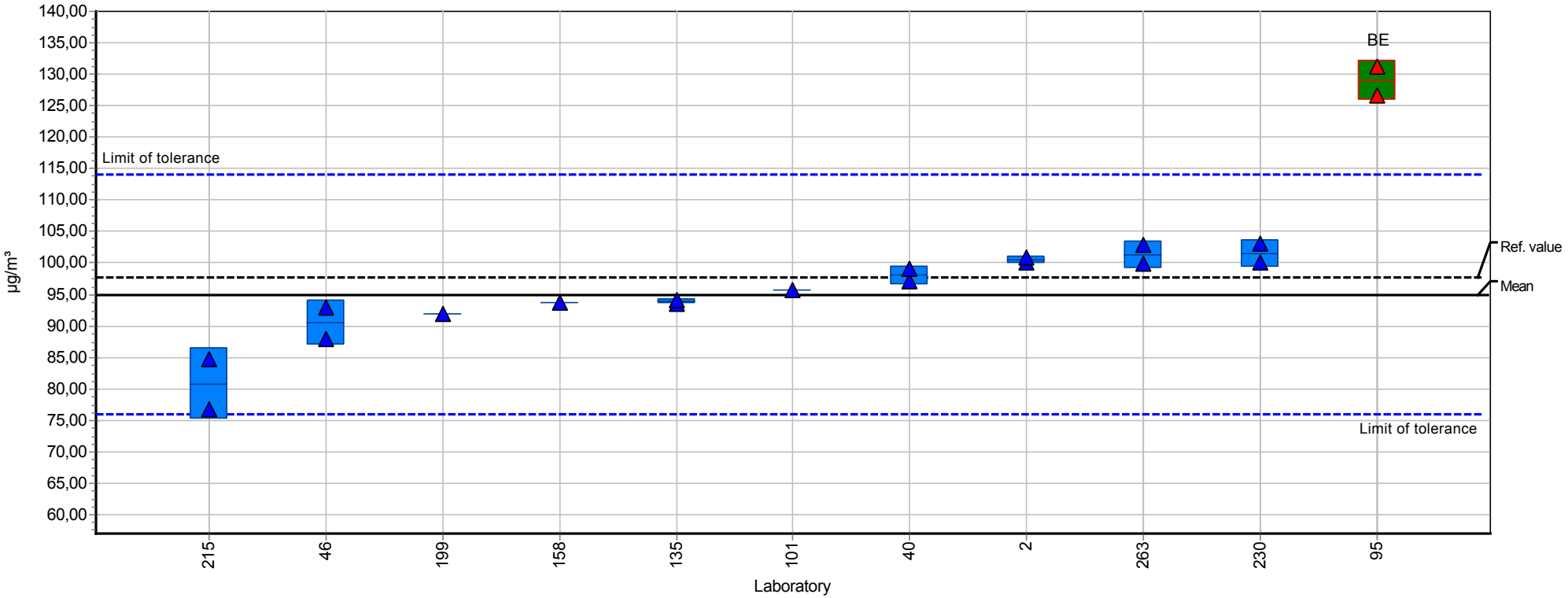
Summary results

Measurand:	**Toluene**	**Mean:**	**80,64 µg/m³**
Sample:	**1**	**Reproducibility s.d.:**	**8,43 µg/m³**
Method:	**ISO 5725-2**	**Relative reproducibility s.d.:**	**10,45%**
Relative target s.d.:	**10,00% (Limited)**	**Reference value:**	**79,30 µg/m³**
No. of laboratories:	**10**	**Range of tolerance:**	**64,51 - 96,77 µg/m³ (|Z-Score| <= 2,00)**



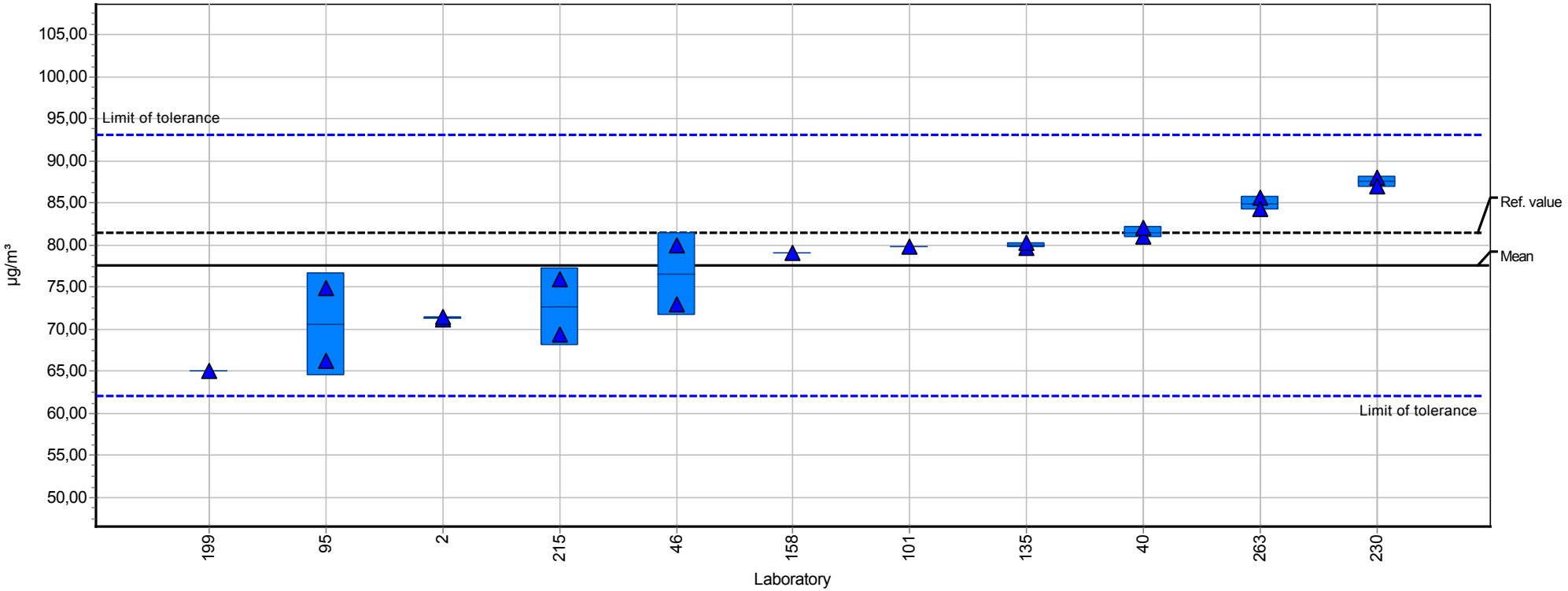
Summary results

Measurand:	**n-Octane**	**Mean:**	**94,97 µg/m³**
Sample:	**1**	**Reproducibility s.d.:**	**7,02 µg/m³**
Method:	**ISO 5725-2**	**Relative reproducibility s.d.:**	**7,40%**
Relative target s.d.:	**10,00% (Limited)**	**Reference value:**	**97,60 µg/m³**
No. of laboratories:	**10**	**Range of tolerance:**	**75,98 - 113,97 µg/m³ (|Z-Score| <= 2,00)**



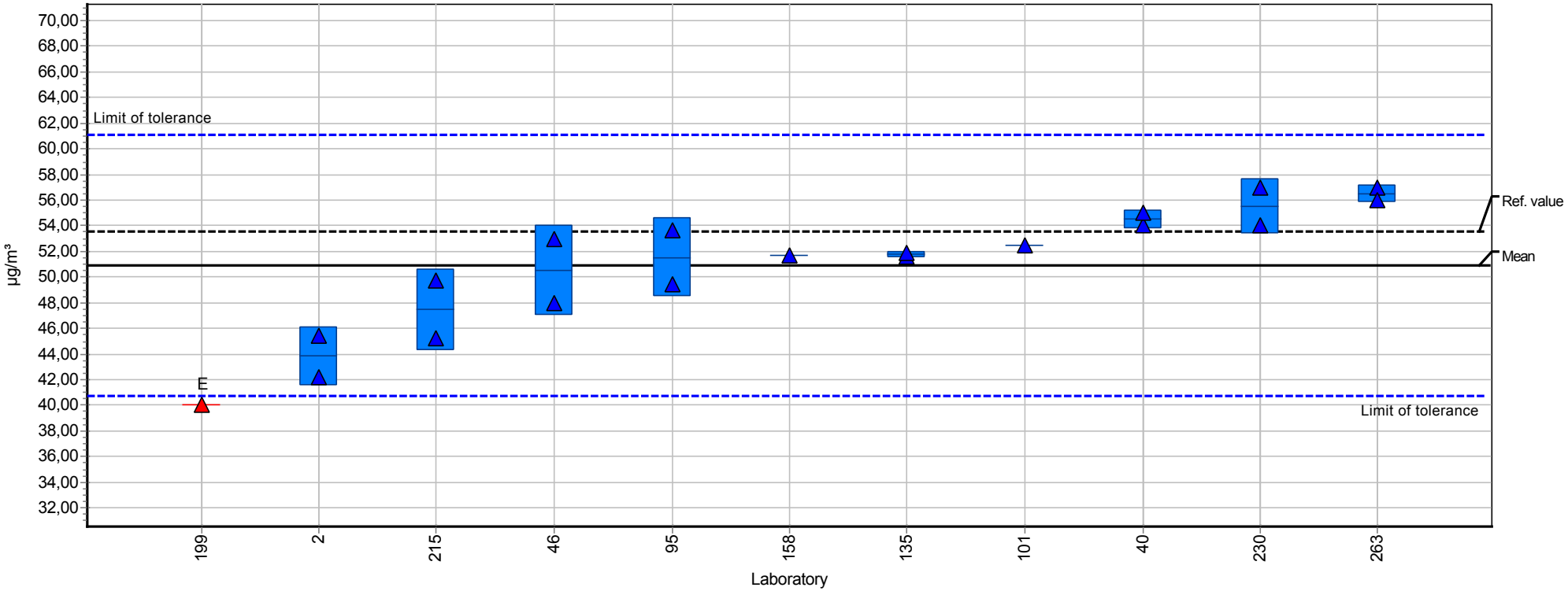
Summary results

Measurand:	**p-Xylene**	**Mean:**	**77,58 µg/m³**
Sample:	**1**	**Reproducibility s.d.:**	**6,89 µg/m³**
Method:	**ISO 5725-2**	**Relative reproducibility s.d.:**	**8,89%**
Relative target s.d.:	**10,00% (Limited)**	**Reference value:**	**81,40 µg/m³**
No. of laboratories:	**11**	**Range of tolerance:**	**62,06 - 93,09 µg/m³ (|Z-Score| <= 2,00)**



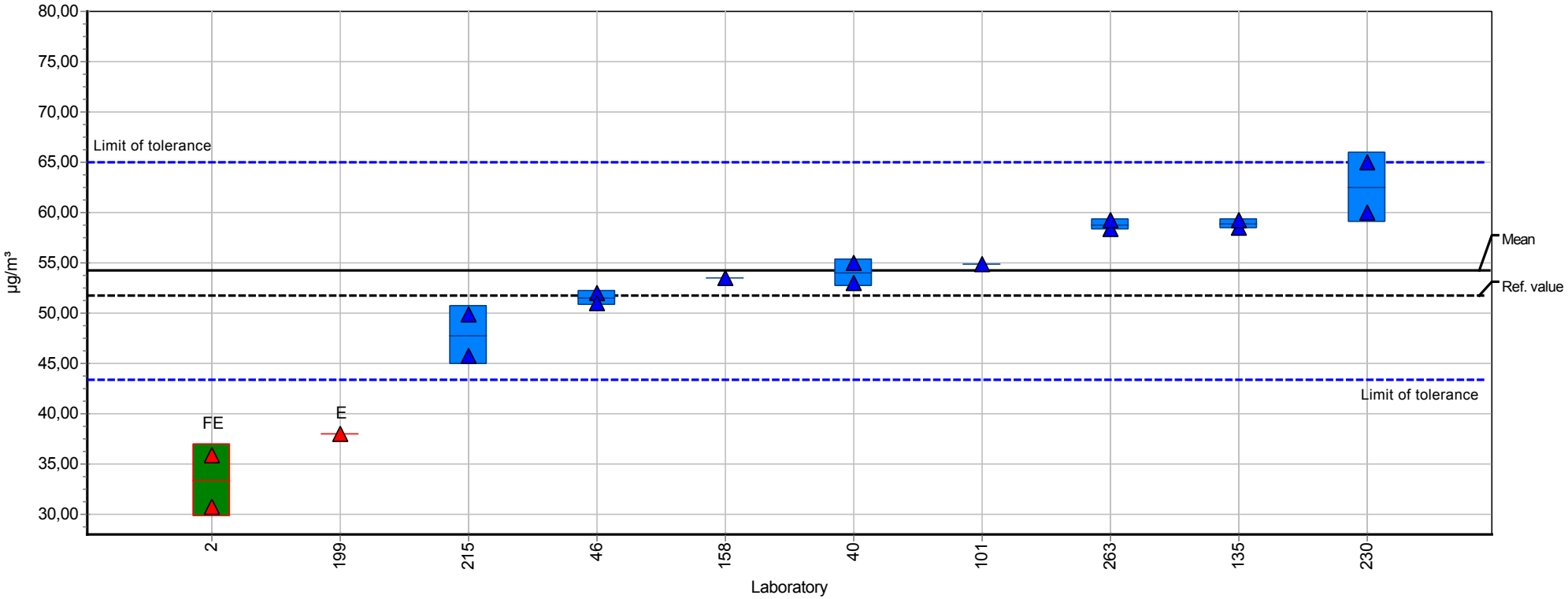
Summary results

Measurand:	**Ethylbenzene**	**Mean:**	**50,91 µg/m³**
Sample:	**1**	**Reproducibility s.d.:**	**4,93 µg/m³**
Method:	**ISO 5725-2**	**Relative reproducibility s.d.:**	**9,69%**
Relative target s.d.:	**10,00% (Limited)**	**Reference value:**	**53,60 µg/m³**
No. of laboratories:	**11**	**Range of tolerance:**	**40,73 - 61,10 µg/m³ (|Z-Score| <= 2,00)**



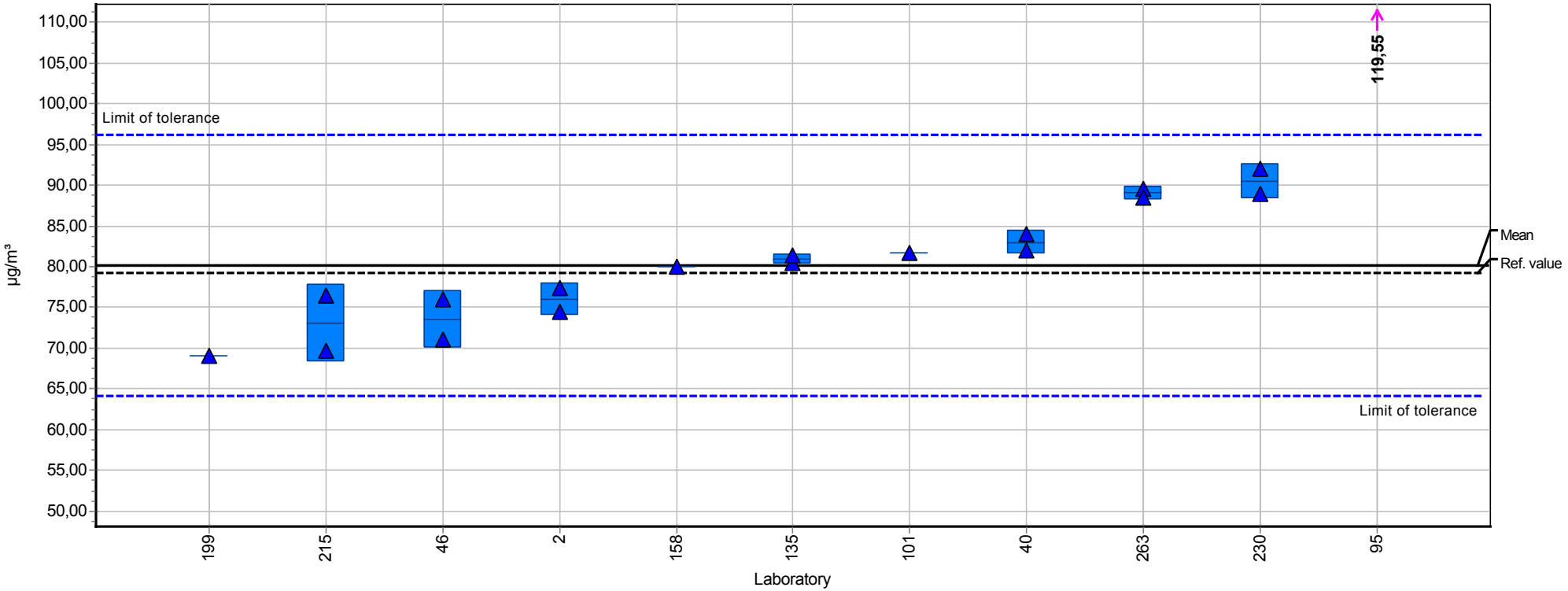
Summary results

Measurand:	**1,2,4-Trimethylbenzene**	**Mean:**	**54,22 µg/m³**
Sample:	**1**	**Reproducibility s.d.:**	**6,77 µg/m³**
Method:	**ISO 5725-2**	**Relative reproducibility s.d.:**	**12,48%**
Relative target s.d.:	**10,00% (Limited)**	**Reference value:**	**51,70 µg/m³**
No. of laboratories:	**9**	**Range of tolerance:**	**43,37 - 65,06 µg/m³ (|Z-Score| <= 2,00)**



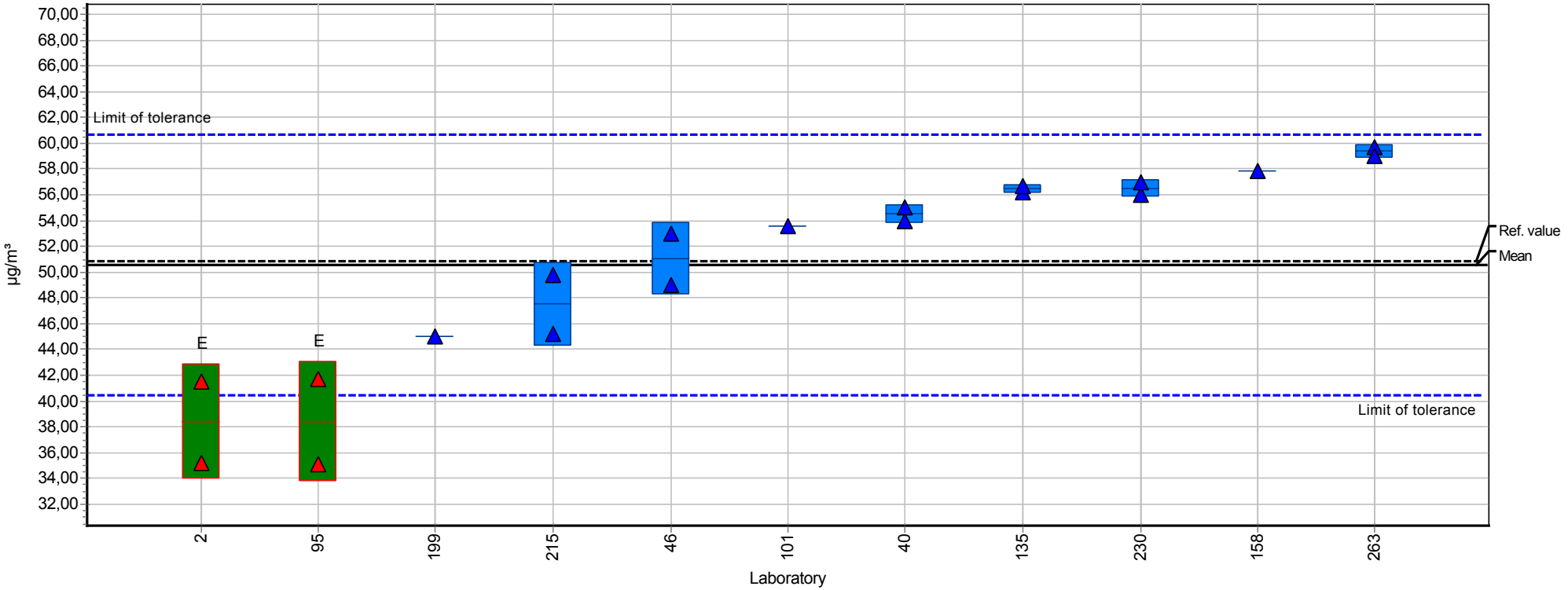
Summary results

Measurand:	**4-Methyl-2-Pentanone**	**Mean:**	**80,15 µg/m³**
Sample:	**1**	**Reproducibility s.d.:**	**7,18 µg/m³**
Method:	**ISO 5725-2**	**Relative reproducibility s.d.:**	**8,95%**
Relative target s.d.:	**10,00% (Limited)**	**Reference value:**	**79,30 µg/m³**
No. of laboratories:	**10**	**Range of tolerance:**	**64,12 - 96,18 µg/m³ (|Z-Score| <= 2,00)**



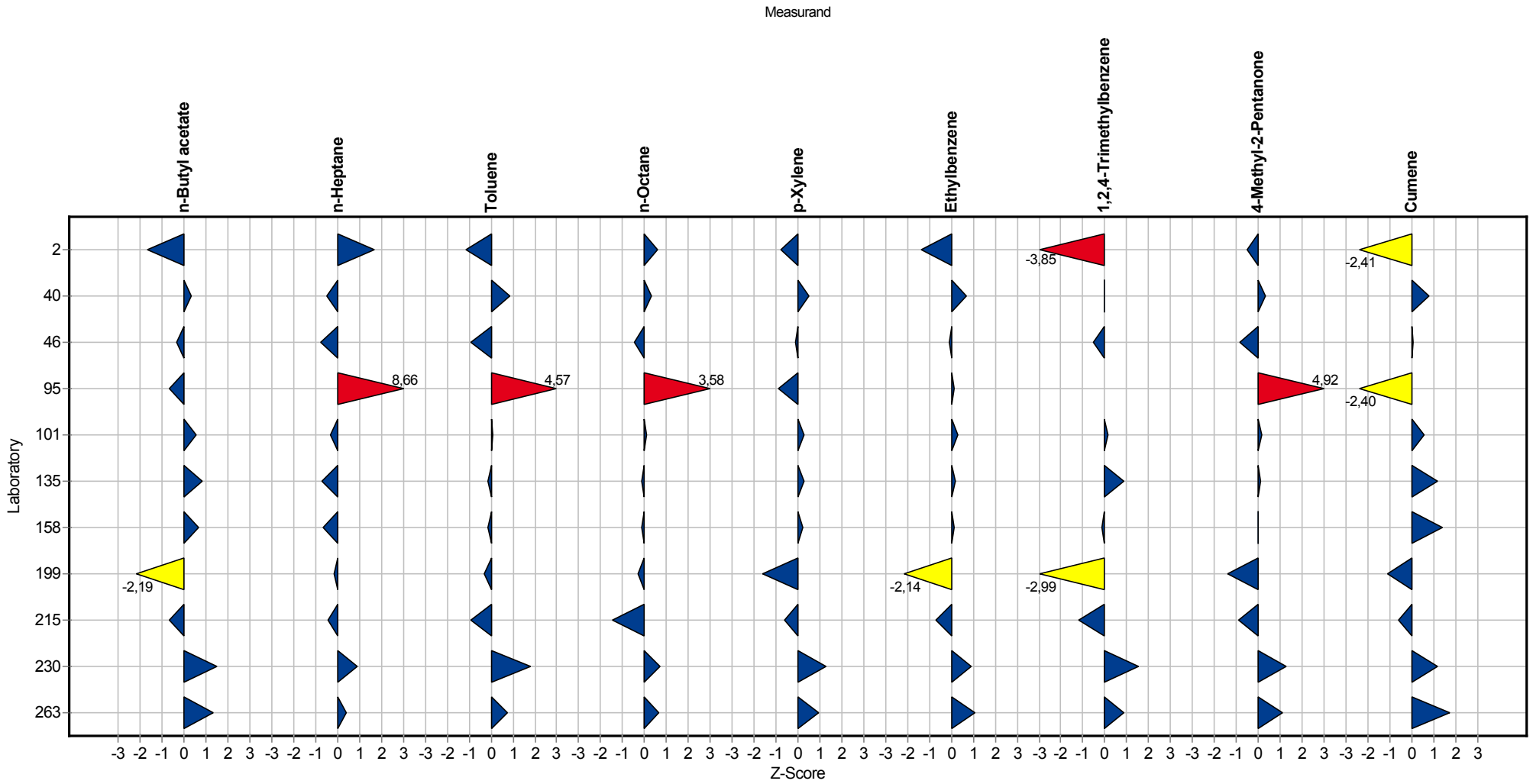
Summary results

Measurand:	**Cumene**	**Mean:**	**50,55 µg/m³**
Sample:	**1**	**Reproducibility s.d.:**	**7,95 µg/m³**
Method:	**ISO 5725-2**	**Relative reproducibility s.d.:**	**15,73%**
Relative target s.d.:	**10,00% (Limited)**	**Reference value:**	**50,80 µg/m³**
No. of laboratories:	**11**	**Range of tolerance:**	**40,44 - 60,66 µg/m³ (|Z-Score| <= 2,00)**



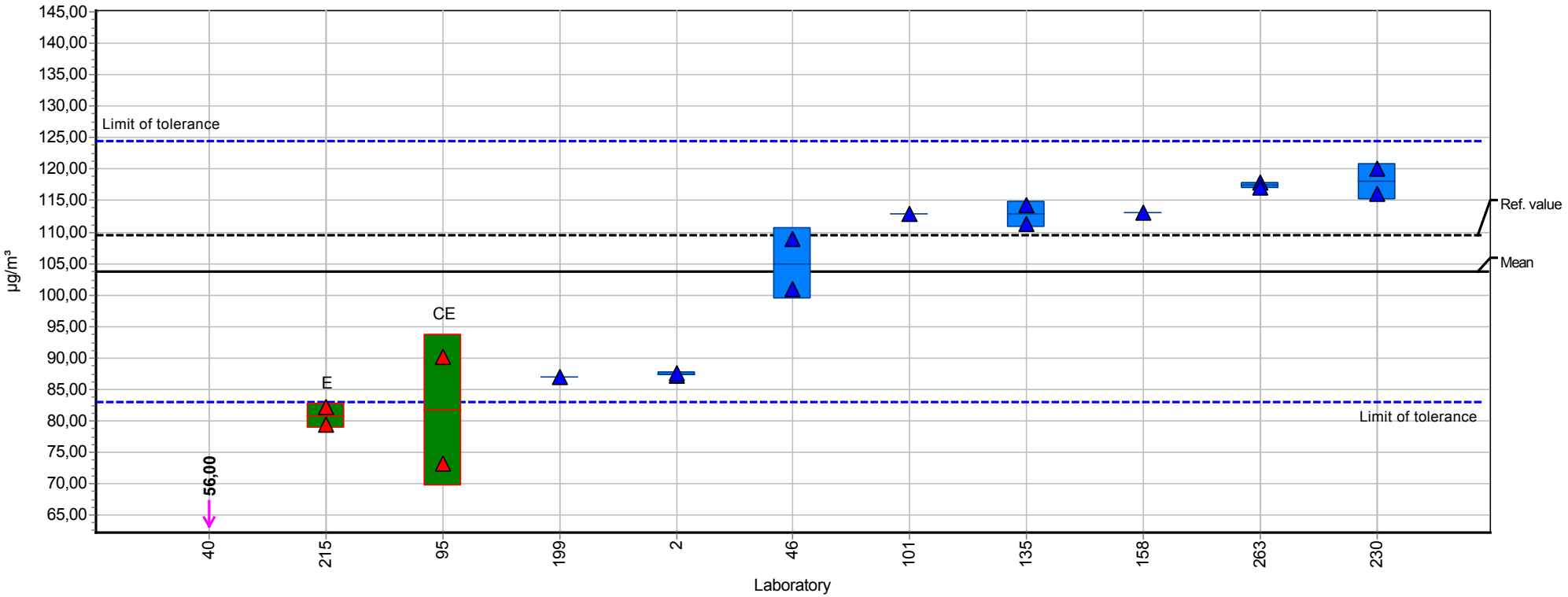
Sample chart of Z-scores

Sample 1



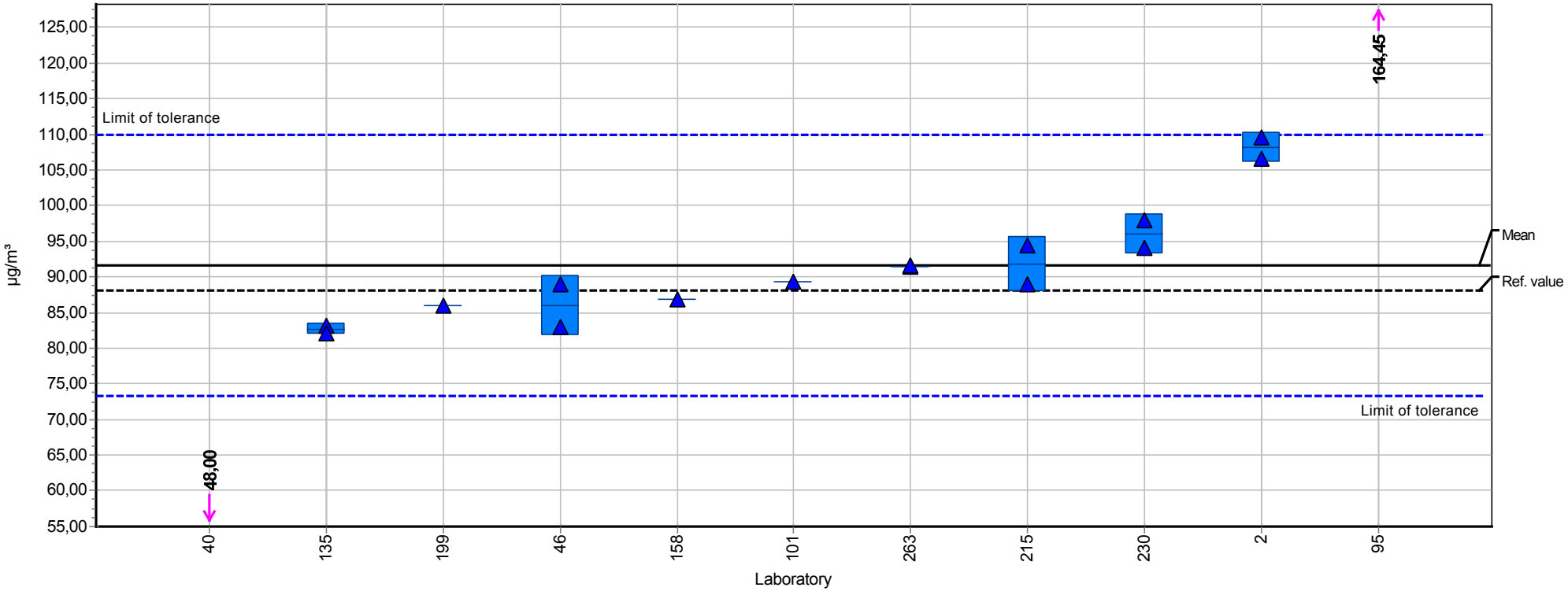
Summary results

Measurand:	**n-Butyl acetate**	**Mean:**	**103,73 µg/m³**
Sample:	**2**	**Reproducibility s.d.:**	**15,17 µg/m³**
Method:	**ISO 5725-2**	**Relative reproducibility s.d.:**	**14,62%**
Relative target s.d.:	**10,00% (Limited)**	**Reference value:**	**109,50 µg/m³**
No. of laboratories:	**9**	**Range of tolerance:**	**82,98 - 124,47 µg/m³ (|Z-Score| <= 2,00)**



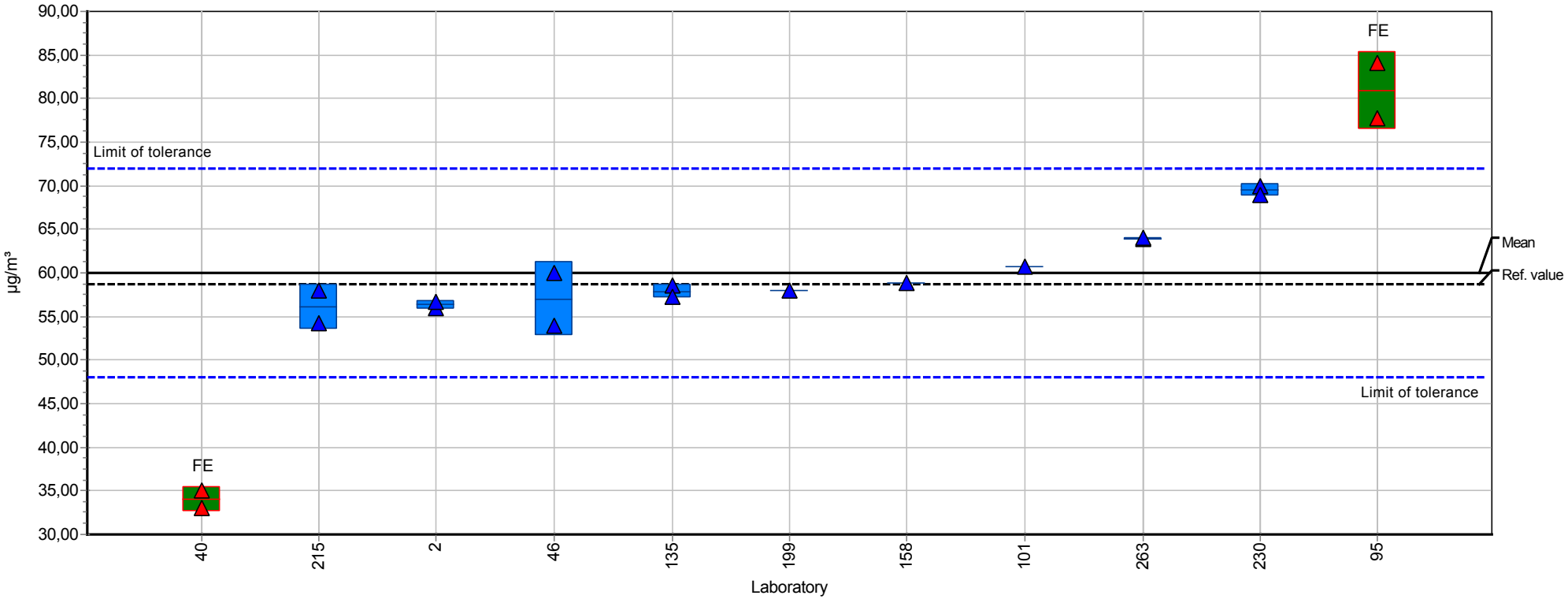
Summary results

Measurand:	**n-Heptane**	**Mean:**	**91,61 µg/m³**
Sample:	**2**	**Reproducibility s.d.:**	**8,29 µg/m³**
Method:	**ISO 5725-2**	**Relative reproducibility s.d.:**	**9,05%**
Relative target s.d.:	**10,00% (Limited)**	**Reference value:**	**88,10 µg/m³**
No. of laboratories:	**9**	**Range of tolerance:**	**73,29 - 109,94 µg/m³ (|Z-Score| <= 2,00)**



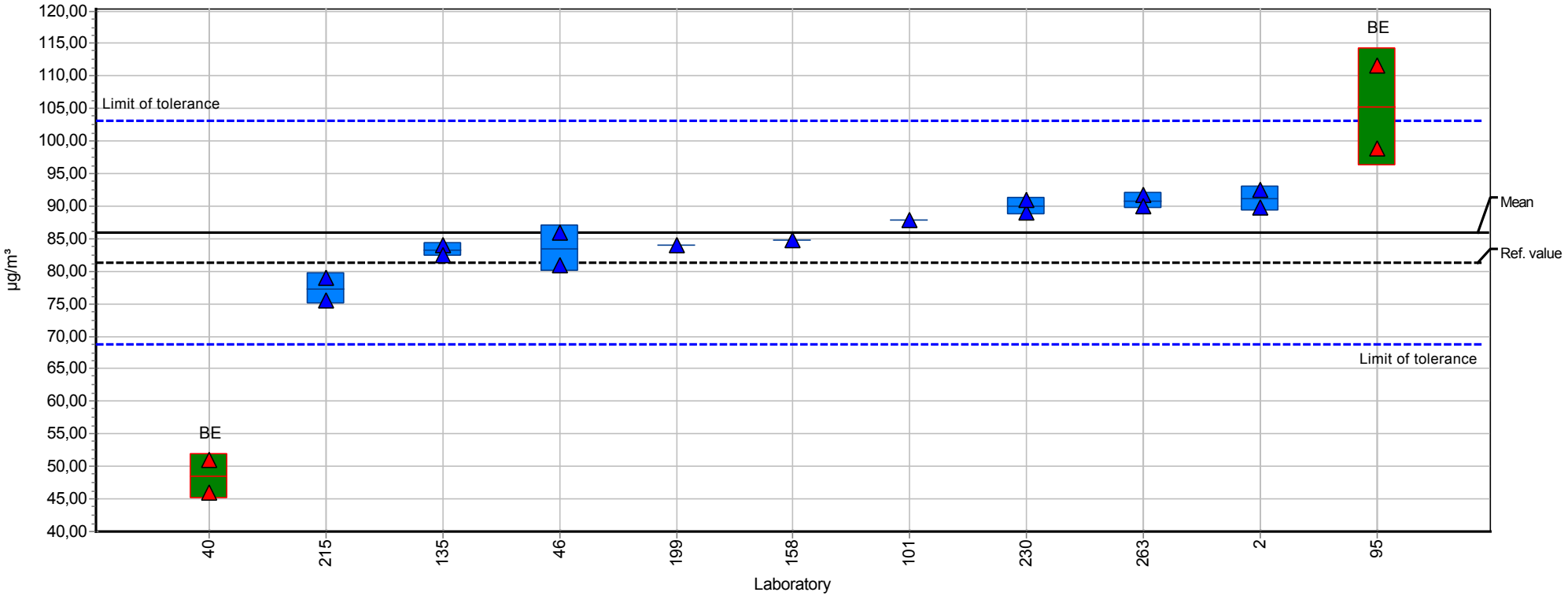
Summary results

Measurand:	**Toluene**	**Mean:**	**59,95 µg/m³**
Sample:	**2**	**Reproducibility s.d.:**	**4,95 µg/m³**
Method:	**ISO 5725-2**	**Relative reproducibility s.d.:**	**8,25%**
Relative target s.d.:	**10,00% (Limited)**	**Reference value:**	**58,70 µg/m³**
No. of laboratories:	**9**	**Range of tolerance:**	**47,96 - 71,94 µg/m³ (|Z-Score| <= 2,00)**



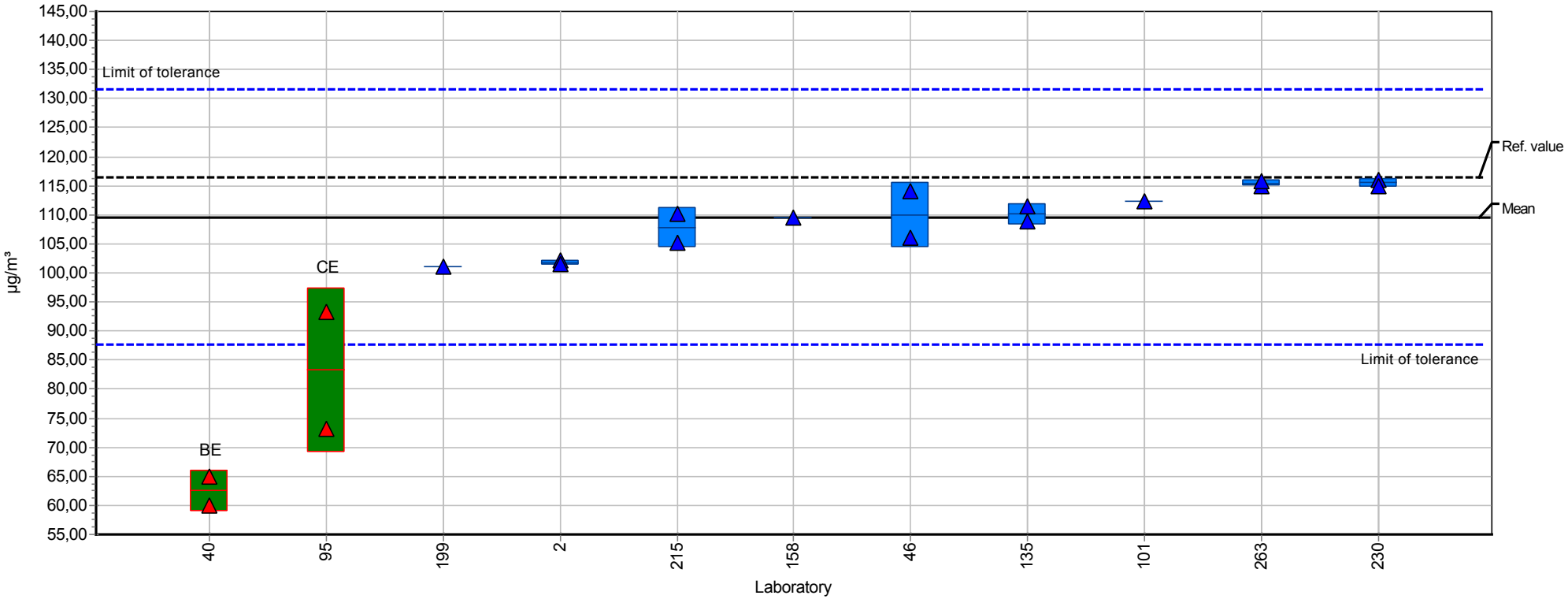
Summary results

Measurand:	**n-Octane**	**Mean:**	**85,92 µg/m³**
Sample:	**2**	**Reproducibility s.d.:**	**5,10 µg/m³**
Method:	**ISO 5725-2**	**Relative reproducibility s.d.:**	**5,94%**
Relative target s.d.:	**10,00% (Limited)**	**Reference value:**	**81,30 µg/m³**
No. of laboratories:	**9**	**Range of tolerance:**	**68,74 - 103,11 µg/m³ (|Z-Score| <= 2,00)**



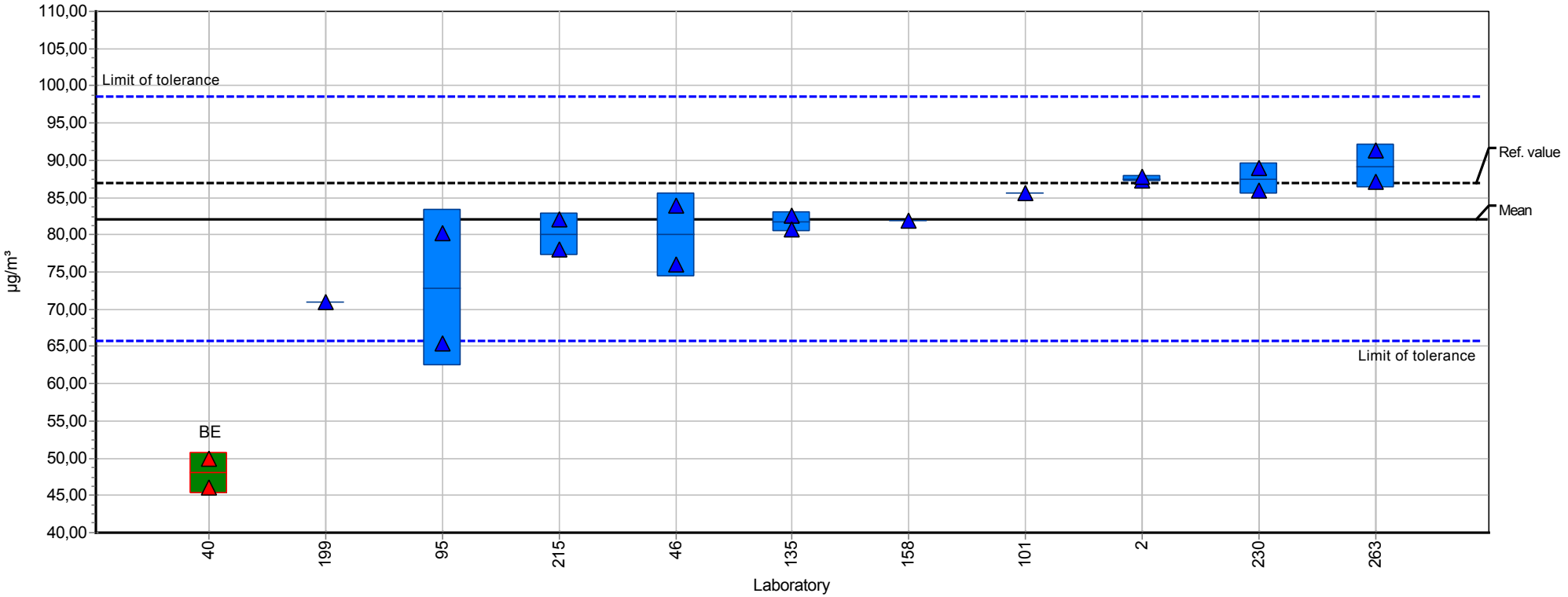
Summary results

Measurand:	**p-Xylene**	**Mean:**	**109,59 µg/m³**
Sample:	**2**	**Reproducibility s.d.:**	**5,44 µg/m³**
Method:	**ISO 5725-2**	**Relative reproducibility s.d.:**	**4,96%**
Relative target s.d.:	**10,00% (Limited)**	**Reference value:**	**116,40 µg/m³**
No. of laboratories:	**9**	**Range of tolerance:**	**87,67 - 131,51 µg/m³ (|Z-Score| <= 2,00)**



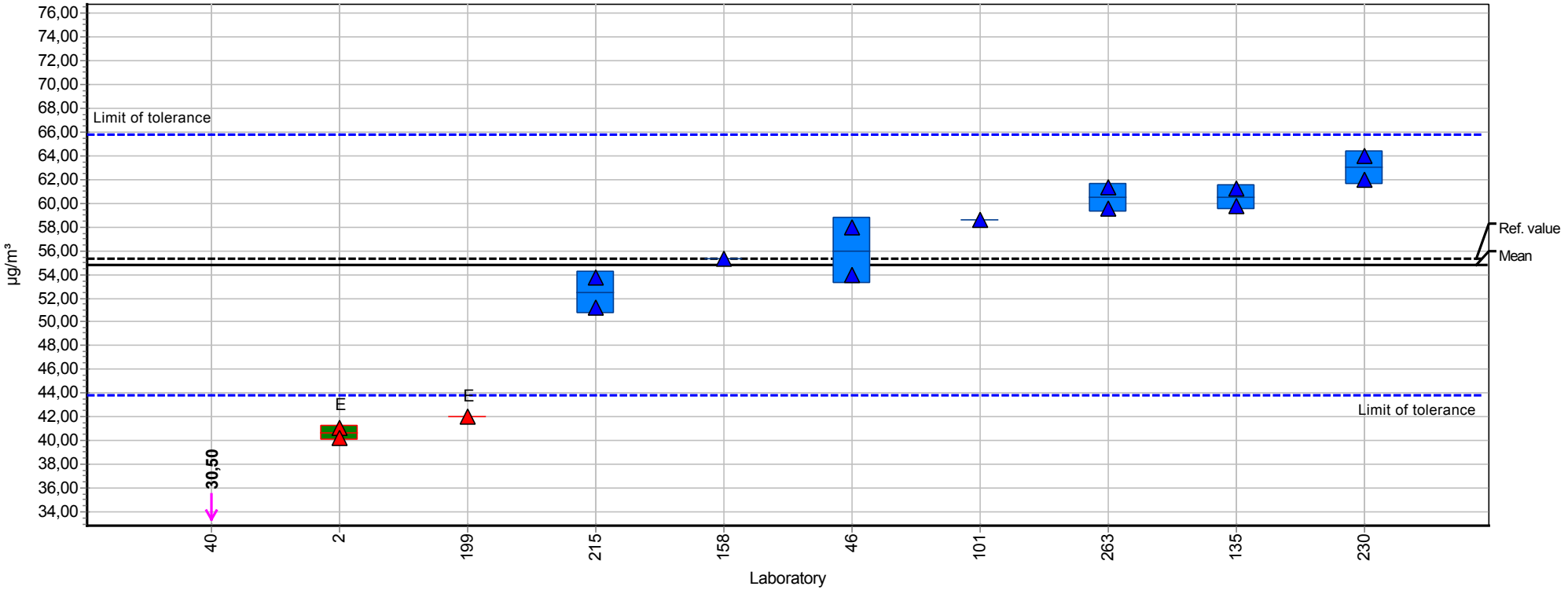
Summary results

Measurand:	**Ethylbenzene**	**Mean:**	**82,10 µg/m³**
Sample:	**2**	**Reproducibility s.d.:**	**6,73 µg/m³**
Method:	**ISO 5725-2**	**Relative reproducibility s.d.:**	**8,20%**
Relative target s.d.:	**10,00% (Limited)**	**Reference value:**	**87,00 µg/m³**
No. of laboratories:	**10**	**Range of tolerance:**	**65,68 - 98,52 µg/m³ (|Z-Score| <= 2,00)**



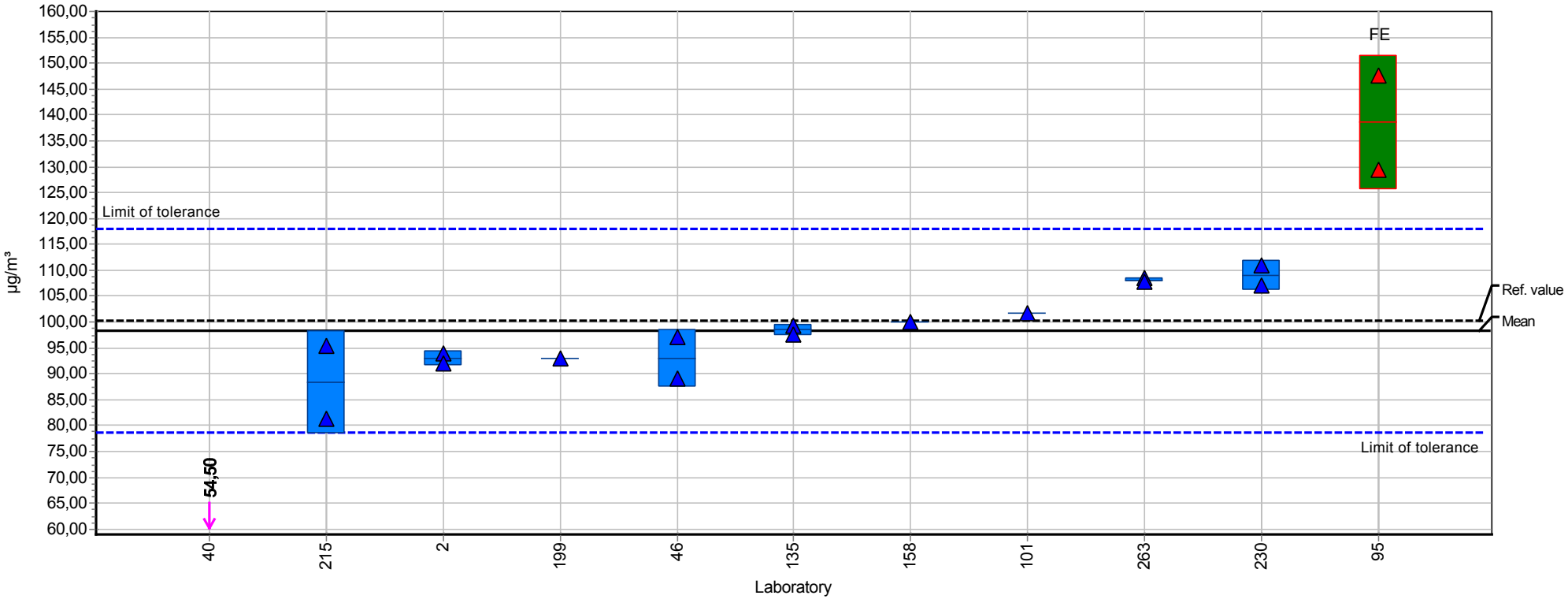
Summary results

Measurand:	**1,2,4-Trimethylbenzene**	**Mean:**	**54,79 µg/m³**
Sample:	**2**	**Reproducibility s.d.:**	**8,10 µg/m³**
Method:	**ISO 5725-2**	**Relative reproducibility s.d.:**	**14,79%**
Relative target s.d.:	**10,00% (Limited)**	**Reference value:**	**55,30 µg/m³**
No. of laboratories:	**9**	**Range of tolerance:**	**43,84 - 65,75 µg/m³ (|Z-Score| <= 2,00)**



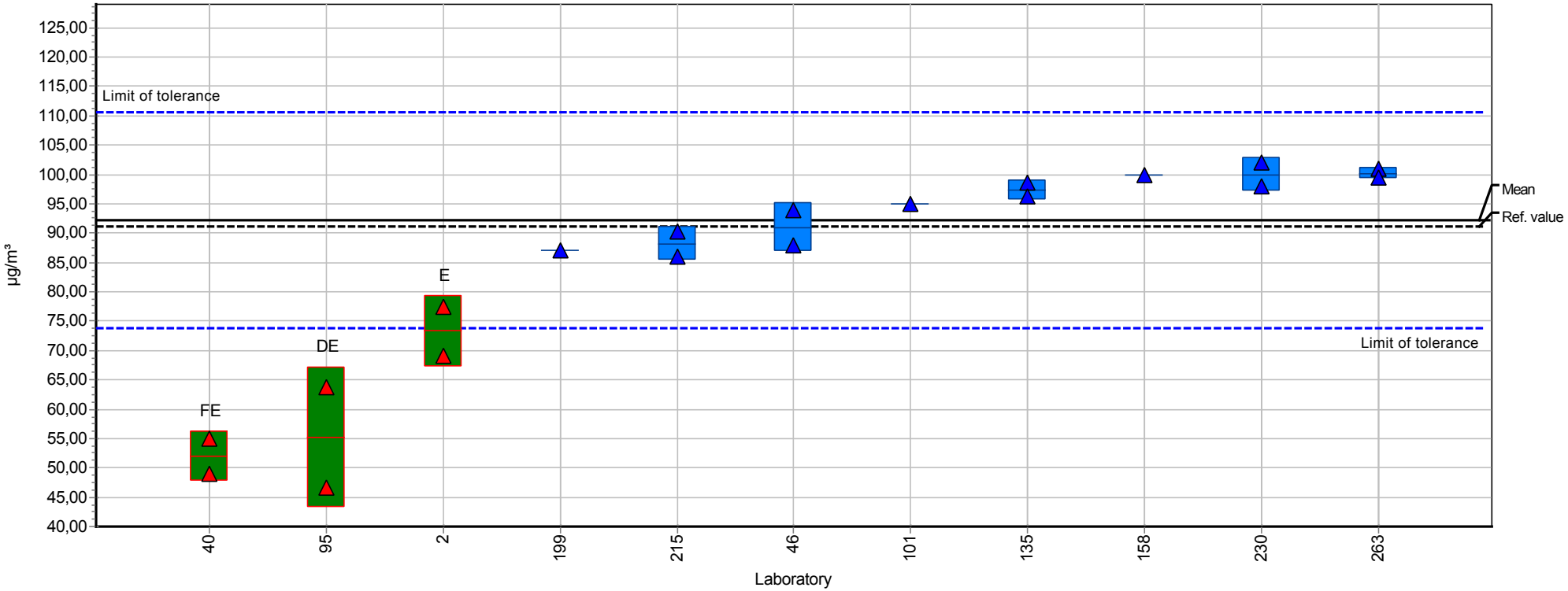
Summary results

Measurand:	**4-Methyl-2-Pentanone**	**Mean:**	**98,30 µg/m³**
Sample:	**2**	**Reproducibility s.d.:**	**8,26 µg/m³**
Method:	**ISO 5725-2**	**Relative reproducibility s.d.:**	**8,40%**
Relative target s.d.:	**10,00% (Limited)**	**Reference value:**	**100,30 µg/m³**
No. of laboratories:	**9**	**Range of tolerance:**	**78,64 - 117,96 µg/m³ (|Z-Score| <= 2,00)**



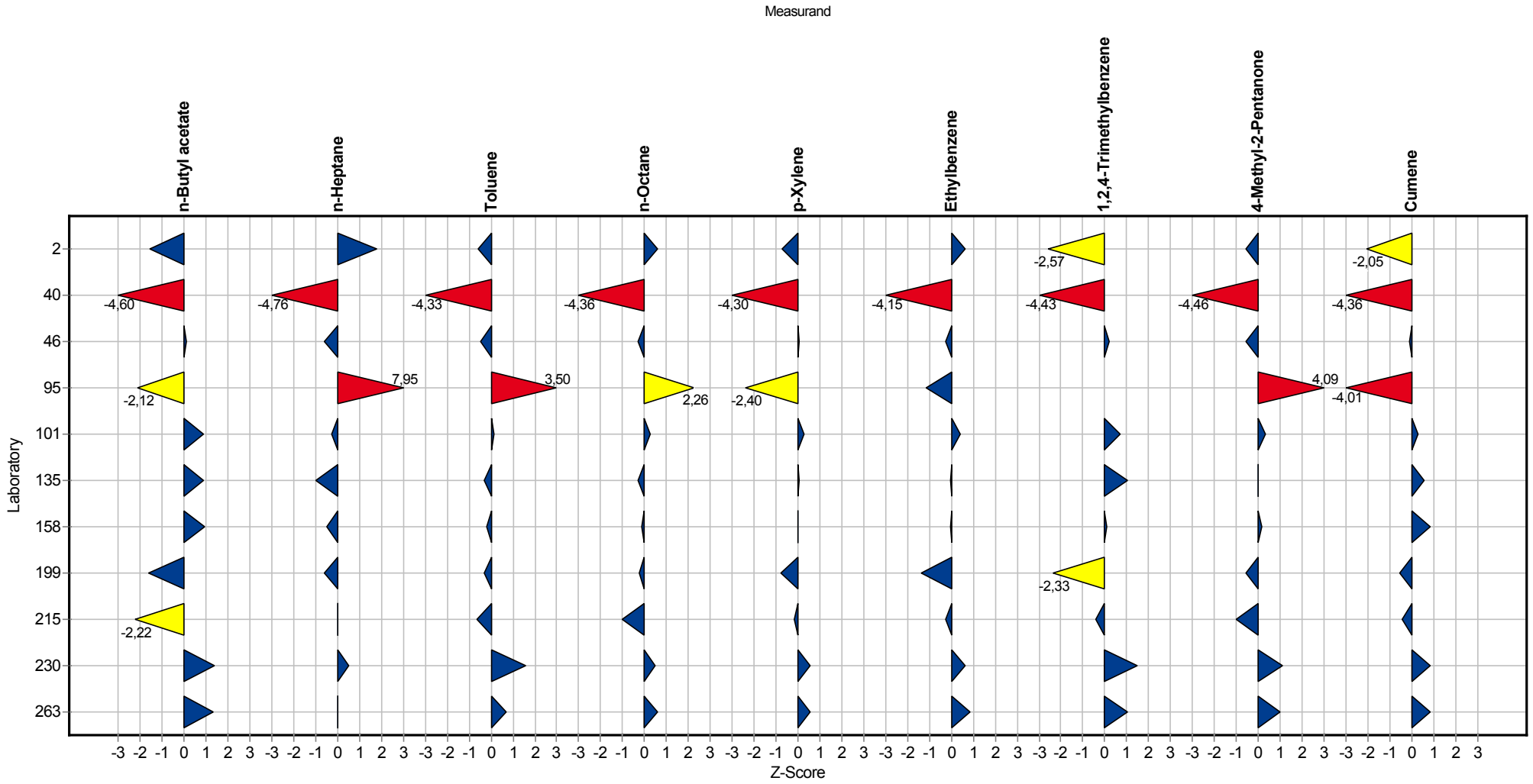
Summary results

Measurand:	**Cumene**	**Mean:**	**92,14 µg/m³**
Sample:	**2**	**Reproducibility s.d.:**	**9,60 µg/m³**
Method:	**ISO 5725-2**	**Relative reproducibility s.d.:**	**10,42%**
Relative target s.d.:	**10,00% (Limited)**	**Reference value:**	**91,10 µg/m³**
No. of laboratories:	**9**	**Range of tolerance:**	**73,71 - 110,57 µg/m³ (|Z-Score| <= 2,00)**



Sample chart of Z-scores

Sample 2



Questions and Answers

Participant	Kind of tube	Sampling pump	Volume flow	Volume flow measurement
2	Tenax TA	Pocket Pump 210-1000, Fa. Analyt-Mic	20 ml/min	Defender 530L, 5-500 ml/min, Fa. Bios
40	Tenax TA	Gilian LFS-113DC	21 ml/min	DryCal DC-Lite
46	Tenax TA	Desaga GS301	0,1 L/min	MFR in Pumpe
95	Tenax	GSA 502ex	0,1 L/min	Drycal
101	Tenax TA	BIVOC2 / GSA SG350	0,1L/min	BIVOC2 / GSA SG350
135	Tenax TA	GSA SG4000ex	70 - 75 ml/min	Gilian Sensidyne Gilibrator-2
158	Tenax TA	Gilian LFS-113 DC Low Flow Sampler	[0,025;0,050;0,100]L/min	Bios Int. Corp. Defender 510-L rev C1
199	Tenax	Du Pont S2500	80 ml/min	Vögtlin Mass Flow
215	Carbotrap (3-Bett-Adsorber)	GS301	0,1 l/min	GS 301
230	Tenax TA	Fa. Holbach, BIVOC 2	0,15 ml/min	TSI, Modell 4100
263	Tenax TA	SG 350 von GSA	0,0919 l/min bis 0,101 l/min	Massflowmeter, Defender 530 von MesaLabs

Participant	Sampling time	Analytical method	thermodesorber	Desorption temperature
2	10 min bzw. 20 min	Nach DIN ISO 16017-1 und DIN 16000-6	Atas Opttik 4	einstufiges System im Injektor Optik 4, 300°C
40	Run1: 87min.; Run2: 70 min; BW 1: 45 min.; BW 2: 52 min.	in Anlehnung an DIN ISO 16000-6	Perkin Elmer Turbo Matrix TD 650	250°C
46	20 min bzw. 40 min	16000-6	Markes	300°C
95	30 min.	DIN EN ISO 16017-1	Gerstel TDS 2-7	280°C
101	20min	DIN ISO 16000-6	Gerstel TDS3	260°C
135	45 Minuten	16000-6	Perkin Elmer TurboMatrix 650	280°C
158	[20;40]Min	DIN ISO 16000-6	Markes TD 100	280
199	25 min	in Anlehnung an DIN ISO 16000-6:2012-11	TD-100 von MARKES	250 °C
215	ca. 20 min	DIN ISO 16000-6	ATD 400	300°C
230	20 Minuten	DIN ISO 16000-6	TDS 3, Fa. Gerstel	40°C bis 260°C
263	10 Minuten	DIN ISO 16000-6	Markes TD 100	280 °C

Participant	Desorption flow	Desorption time	Cyro trap	Carrier gas	Flow rate	Analytical column
2	1 ml/min	5 min	Keine Kryofokussierung	Helium	1 ml/min	RTX-VMS 60m
40	10	10 + 2	Airtox 4 °C, 325°C; 40°C/min.	Helium	2,6 ml/min	HP-5MS 30x0,25; 0.25µm

Round-robin test VOC with sampling 1/2016

Participant	Desorption flow	Desorption time	Cyro trap	Carrier gas	Flow rate	Analytical column
46	50	15	-10°C // Rate: max °C/min // 310°C	Helium	1,8 (Säulenfluss)	Rxi (R) 5Sil MS
95	30ml/min.	7 min	- 145°C	Helium	0,8 ml/min	Rtx-502.2
101	1,2mL/min	5min	-30°C 260°C	Helium	1,2mL/min	DB-624 30m, ID 0,250mm, Film 1,40µm
135	29	15	-20°C/300°C	Helium	1,5	RTX-200
158	75	8	-10 und +310	Helium	1 ml/min	Resteck RTX-1 60m, ID 0,25 x 1µm
199	50 mL/min	5 min	25 bis 300 °C	Helium	0,7 mL/min	DB5-5.625MS
215	ca. 30 ml/imn	10 min	5°C & 300°C	He 5.0	4,0	DB5 MS
230	30 ml/min	5 Minuten	- 30°C - 10K/min auf 280°C	Helium	0,6 ml/min	Optima 1 MS Accent, MN 60 m
263	50	10	5 °C	Helium	1,5	ZB-1701

Participant	Data evaluation	Detector
2	5-Punkt ESTD Kaibrierung	MS
40	ISTD FID; MS	FID; Massenspektrometer
46	substanzspezifisch, Referenzsubstanzen	MS
95	Identifizierung über MS/Rt, Quantifizierung IntStd/Referenzsubstanz	MSD 5975 N
101	Es wurde per externen Standard quantifiziert. Die Identifikation wurde mittels Retentionszeit und Massenspektrum durchgeführt.	MSD
135	externer Standard, Retentionszeit- und Massenspektrenvergleich	MSD
158	SimIon, Interne Std.-Methode	MSD Agilent 5978C
199	Externe Kalibrierung	5977A MSD
215	FID (quant.), MS (ident.)	FID & MS
230	Referenzstandard bekannter Konzentration, mit eigener Belegung der Tenax-Röhrchen, Identifizierung RT + Massenspektrum	MS
263	Über eine externe Kalibrierung bezogen auf den internen Standard	MSD

Participant	Recovery rate	Date of analysis
2	nein	03.05.2016
40	Ja	29.04.16
46	nein	05.05.2016
95	Nein, da über das Gesamtverfahren kalibriert	11.05.2016
101	nein	03.05.2016 - 06.05.2016
135	nicht erforderlich	9. 5. 2016
158	Es wurde ein Kontrollstandard eingesetzt	27.04.2016 bis 03.05.2016

Round-robin test VOC with sampling 1/2016

Participant	Recovery rate	Date of analysis
199	nein	31.05.2016
215	nein	20.04. - 03.05.2016
230	nein	13.05.2015
263	Nein	06.06.2016

Blank Values
RRT VOC with sampling 2/2016

Blank 1, 26 April 2016

	Measurant [µg/m³]								
Lab.	n-Butyl-acetate	n-Heptane	Toluene	n-Octane	p-Xylene	Ethyl-benzene	1,2,4-Trimethyl-benzene	4-Methyl -2-Pentanone	Cumene
2	1,15	0	0	0	0,40	0	0	0	0
40	< 5,1	< 5,1	< 5,1	< 5,1	< 5,1	< 5,1	< 5,1	< 5,1	< 5,1
46	0,1	0,3	0,3	1,1	0,1	0,1	1,3	0,2	0,1
95	2,6	1,4	1,9	3,9	4,0	1,1		0,1	0,1
101	0	0	0	0	0,11	0	0	0	0
135	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
158									
199	0,35	0,18	0,55	0,11	0,38	0,30	0,38	0,23	0,15
215			0,1		0,2				
230	< 2	4	3	< 2	< 2	< 2	< 2	< 2	< 2
263	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
IFA	**< 5,0**	**< 5,0**	**< 5,0**	**< 5,0**	**< 5,0**	**< 5,0**	**< 5,0**	**< 10,0**	**< 10,0**

Blank 2, 27 April 2016

	Measurant [µg/m³]								
Lab.	n-Butyl-acetate	n-Heptane	Toluene	n-Octane	p-Xylene	Ethyl-benzene	1,2,4-Trimethyl-benzene	4-Methyl -2-Pentanone	Cumene
2	1,58	0	1,14	0	0,83	0	0	0	0
40	< 4,4	< 4,4	< 4,4	< 4,4	< 4,4	< 4,4	< 4,4	< 4,4	< 4,4
46	0,1	0,2	0,2	0,9	0,1	0,1	1,2	0,1	0,1
95	0,9	0,7	0,8	0,2	0,6	0,3		0,7	0,1
101	0	0	0	0	0	0	0	0	0
135	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
158									
199	1,68	0,13	1,00	0,24	0,58	0,48	1,18	1,08	0,69
215			0,2	0,1	0,1	0,1			
230	< 2	3	5	< 2	< 2	< 2	< 2	< 2	< 2
263	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
IFA	**< 5,0**	**< 5,0**	**< 5,0**	**< 5,0**	**< 5,0**	**< 5,0**	**< 5,0**	**< 10,0**	**< 10,0**