

# **Round-robin tests for in-house measuring laboratories**

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## ***Results and Evaluation***

Round-robin test

„Aldehydes 2015“

## Summary of laboratory test results

Sample 1

Unit	Formaldehyde Z score		Acetaldehyde Z score		Propionaldehyde Z score		Butyraldehyde Z score	
	mg/m <sup>3</sup>		mg/m <sup>3</sup>		mg/m <sup>3</sup>		mg/m <sup>3</sup>	
10	0,0503	-0,74	0,358	0,15	0,278	-0,28	0,375	1,41
19	0,0612	1,27	0,388	1,00	0,316	1,05	0,328	-0,02
25	0,0561	0,33	0,373	0,58	0,310	0,84		
30	0,0570	0,49	0,356	0,10	0,295	0,31	0,342	0,41
44	0,0560	0,31	0,325	-0,78	0,271	-0,52	0,307	-0,66
55	0,0510	-0,61	0,334	-0,53	0,267	-0,66	0,313	-0,47
56	0,0500	-0,80	0,350	-0,07	0,280	-0,21	0,320	-0,26
58	0,0516	-0,50	0,343	-0,26	0,281	-0,17	0,343	0,43
60	0,0517	-0,47	0,349	-0,09	0,299	0,44	0,327	-0,05
62	0,0500	-0,80	0,330	-0,64	0,280	-0,21	0,300	-0,87
67	0,0550	0,13	0,354	0,04	0,278	-0,28	0,344	0,47
68	0,0500	-0,80	0,460	3,05 BE	0,570	9,93 BE	0,180	-4,52 BE
69	0,0600	1,05	0,310	-1,22	0,285	-0,04		
88	0,0470	-1,35	0,355	0,07	0,299	0,45	0,326	-0,07
100	0,0529	-0,26	0,357	0,14	0,289	0,12	0,335	0,20
108	0,0577	0,62	0,357	0,13	0,293	0,24	0,343	0,44
135	0,0545	0,03	0,330	-0,64	0,294	0,28	0,278	-1,54
151	0,0530	-0,24	0,350	-0,07	0,264	-0,77	0,294	-1,05
167	0,0510	-0,61	0,355	0,07	0,288	0,07	0,342	0,41
170	0,0460	-1,53	0,291	-1,75	0,217	-2,41 BE	0,243	-2,60 E
174	0,0500	-0,80	0,344	-0,24	0,274	-0,42	0,331	0,07
186	0,0513	-0,55	0,365	0,34	0,302	0,57	0,346	0,54
190	0,0640	1,78	0,347	-0,16	0,255	-1,08	0,294	-1,05
191	0,0500	-0,80	0,350	-0,07	0,287	0,04	0,335	0,20
195	0,0614	1,30	0,387	0,97	0,312	0,90		
197	0,0530	-0,24	0,353	0,01	0,291	0,18	0,333	0,13
199	0,0610	1,23	0,373	0,58	0,278	-0,28	0,305	-0,72
205	0,0500	-0,80	0,310	-1,21	0,250	-1,26	0,330	0,04

	Formaldehyde Z score		Acetaldehyde Z score		Propionaldehyde Z score		Butyraldehyde Z score	
207	0,0570	0,49	0,336	-0,47	0,284	-0,07	0,334	0,17
208	0,0540	-0,06	0,339	-0,39	0,272	-0,49	0,321	-0,23
214	0,0550	0,13	0,360	0,21	0,280	-0,21	0,300	-0,87
219	0,0520	-0,43	0,354	0,04	0,287	0,04	0,336	0,23
224	0,0570	0,49	0,823	13,34 BE	0,389	3,60 BE	0,400	2,17 E
225	0,0480	-1,16	0,348	-0,13	0,305	0,66	0,324	-0,14
264	0,0500	-0,80	0,400	1,34	0,300	0,49	0,260	-2,09 E
267	0,0550	0,13	0,353	0,01	0,287	0,04	0,338	0,29
269	0,0680	2,52 E	0,368	0,44	0,298	0,42	0,343	0,44
273	0,0590	0,86	0,381	0,81	0,285	-0,03	0,381	1,60
274	0,0550	0,13	0,375	0,64	0,282	-0,14	0,377	1,47
280	0,0600	1,05	0,390	1,06	1,240	33,36 BE	0,380	1,57
-	-	--	-	--	-	--	-	--
Method	ISO 5725-2		ISO 5725-2		ISO 5725-2		ISO 5725-2	
Assessment	Z <=2,00		Z <=2,00		Z <=2,00		Z <=2,00	
No. of laboratories that submitted results	40		40		40		37	
Mean	0,0543		0,353		0,286		0,329	
Reproducibility s.d.	0,0048		0,023		0,015		0,032	
Rel. reproducibility s.d.	8,92 %		6,43 %		5,18 %		9,87 %	
Reference value	0,0490		0,346		0,285		0,332	
Target s.d.	0,0054		0,035		0,029		0,033	
Rel. target s.d.:	10,00 %		10,00 %		10,00 %		10,00 %	
Lower limit of tolerance	0,0435		0,282		0,229		0,263	
Upper limit of tolerance	0,0652		0,423		0,343		0,394	
Type B outliers			2		4		1	
Number of laboratories with replicates outside of tolerance limits	1		2		4		4	
No. of laboratories after elimination of outliers type A-D and F (without laboratories that only gave states but no measured values)	40		38		36		36	
Explanation of outlier types								
A: Single outlier	Grubbs							

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	Formaldehyde Z score	Acetaldehyde Z score	Propionaldehyde Z score	Butyraldehyde Z score
B: Differing laboratory mean	Grubbs			
C: Excessive laboratory s.d.	Cochran			
D: Excluded manually				
E: mean outside tolerance limits				
F: $ Z\text{-Score}  > 3,5$				

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## Summary of laboratory test results

Sample 2

Unit	Formaldehyde Z score		Acetaldehyde Z score		Propionaldehyde Z score		Butyraldehyde Z score	
	mg/m <sup>3</sup>		mg/m <sup>3</sup>		mg/m <sup>3</sup>		mg/m <sup>3</sup>	
10	0,1010	-0,46	0,525	0,15	0,428	-0,22	0,468	0,68
19	0,1150	0,86	0,580	1,21	0,493	1,26	0,440	0,04
25	0,1080	0,20	0,531	0,27	0,466	0,64		
30	0,1100	0,39	0,534	0,32	0,468	0,69	0,468	0,68
44	0,1060	0,01	0,468	-0,95	0,419	-0,43	0,402	-0,83
55	0,0950	-1,02	0,435	-1,59	0,380	-1,32	0,390	-1,10
56	0,1000	-0,55	0,500	-0,33	0,430	-0,18	0,430	-0,19
58	0,1020	-0,36	0,503	-0,27	0,439	0,03	0,455	0,37
60	0,0967	-0,86	0,463	-1,04	0,447	0,20	0,423	-0,35
62	0,1000	-0,55	0,480	-0,72	0,430	-0,18	0,400	-0,88
67	0,1060	0,01	0,516	-0,02	0,432	-0,13	0,452	0,31
68	0,1000	-0,55	0,650	2,57 E	0,870	9,87 BE	0,280	-3,61 BE
69	0,1183	1,18	0,459	-1,12	0,448	0,23		
88	0,1013	-0,43	0,513	-0,08	0,459	0,49	0,436	-0,05
100	0,1017	-0,39	0,502	-0,30	0,434	-0,08	0,436	-0,06
108	0,1060	0,01	0,517	-0,01	0,452	0,32	0,456	0,40
135	0,1010	-0,46	0,458	-1,15	0,442	0,10	0,365	-1,67
151	0,1010	-0,46	0,512	-0,10	0,414	-0,54	0,392	-1,06
167	0,0990	-0,65	0,518	0,01	0,446	0,19	0,452	0,31
170	0,1020	-0,36	0,491	-0,51	0,384	-1,23	0,376	-1,42
174	0,1010	-0,46	0,507	-0,20	0,434	-0,09	0,448	0,22
186	0,1000	-0,55	0,516	-0,02	0,449	0,24	0,457	0,42
190	0,1220	1,53	0,503	-0,28	0,402	-0,82	0,406	-0,74
191	0,0980	-0,74	0,496	-0,41	0,437	-0,02	0,440	0,04
195	0,1168	1,04	0,556	0,75	0,484	1,06		
197	0,1080	0,20	0,527	0,19	0,412	-0,59	0,455	0,38
199	0,1190	1,24	0,539	0,42	0,433	-0,11	0,406	-0,74
205	0,0990	-0,65	0,450	-1,30	0,380	-1,32	0,440	0,04

	Formaldehyde Z score		Acetaldehyde Z score		Propionaldehyde Z score		Butyraldehyde Z score	
207	0,1080	0,20	0,495	-0,43	0,444	0,14	0,457	0,42
208	0,0970	-0,84	0,479	-0,74	0,409	-0,66	0,418	-0,47
214	0,1100	0,39	0,530	0,25	0,430	-0,18	0,410	-0,65
219	0,1000	-0,55	0,510	-0,14	0,438	0,00	0,454	0,36
224	0,1080	0,20	1,154	12,31 BE	0,582	3,29 BE	0,519	1,84
225	0,0940	-1,12	0,508	-0,18	0,474	0,83	0,428	-0,24
264	0,1000	-0,55	0,620	1,99	0,470	0,73	0,370	-1,56
267	0,1050	-0,08	0,507	-0,20	0,440	0,05	0,448	0,22
269	0,1220	1,53	0,538	0,40	0,465	0,62	0,462	0,54
273	0,1150	0,86	0,567	0,96	0,446	0,19	0,495	1,29
274	0,1110	0,49	0,560	0,83	0,442	0,10	0,489	1,15
280	0,1300	2,28 E	0,610	1,79	2,110	38,19 BE	0,540	2,32 E
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Method	ISO 5725-2		ISO 5725-2		ISO 5725-2		ISO 5725-2	
Assessment	Z <=2,00		Z <=2,00		Z <=2,00		Z <=2,00	
No. of laboratories that submitted results	40		40		40		37	
Mean	0,1058		0,517		0,438		0,438	
Reproducibility s.d.	0,0084		0,045		0,026		0,039	
Rel. reproducibility s.d.	7,92 %		8,73 %		5,99 %		8,81 %	
Reference value	0,0960		0,496		0,440		0,439	
Target s.d.	0,0106		0,052		0,044		0,044	
Rel. target s.d.:	10,00 %		10,00 %		10,00 %		10,00 %	
Lower limit of tolerance	0,0847		0,414		0,350		0,351	
Upper limit of tolerance	0,1270		0,621		0,525		0,526	
Type B outliers			1		3		1	
Number of laboratories with replicates outside of tolerance limits	1		2		3		2	
No. of laboratories after elimination of outliers type A-D and F (without laboratories that only gave states but no measured values)	40		39		37		36	
Explanation of outlier types								
A: Single outlier	Grubbs							

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	Formaldehyde Z score	Acetaldehyde Z score	Propionaldehyde Z score	Butyraldehyde Z score
B: Differing laboratory mean	Grubbs			
C: Excessive laboratory s.d.	Cochran			
D: Excluded manually				
E: mean outside tolerance limits				
F: $ Z\text{-Score}  > 3,5$				

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# Summary of laboratory test results

Sample 3

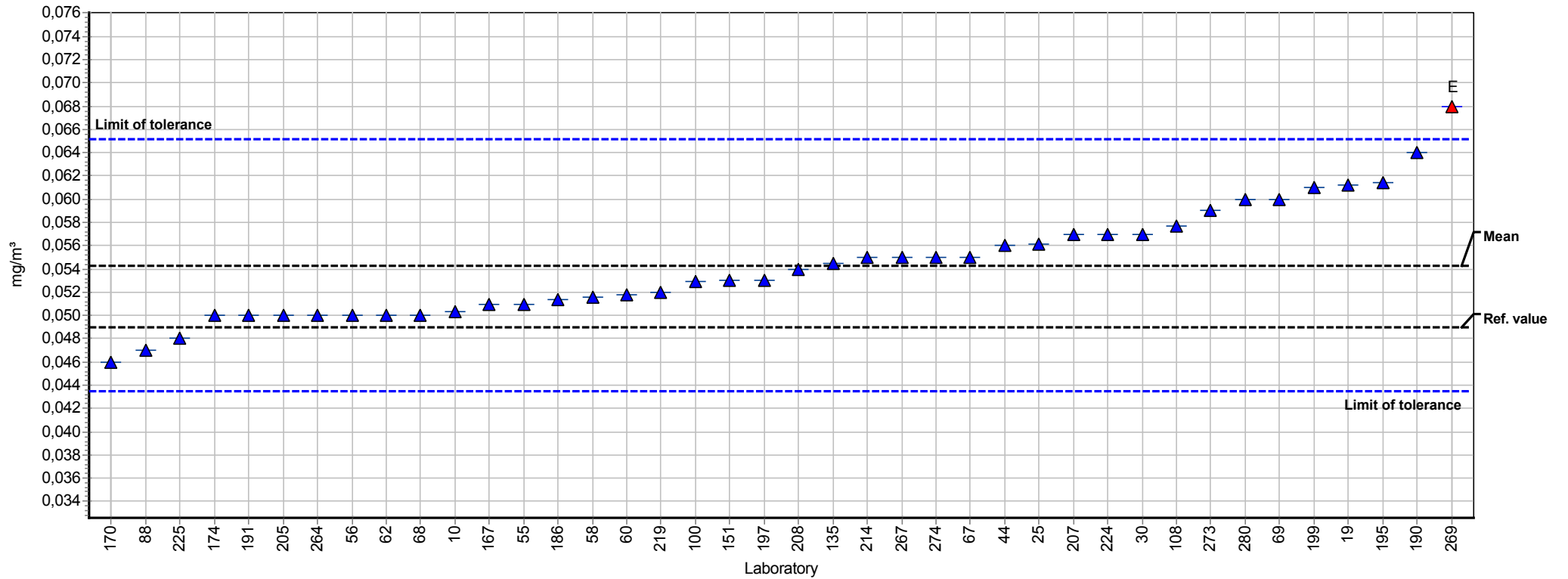
Unit	Formaldehyde Z score		Acetaldehyde Z score		Butyraldehyde Z score	
	mg/m <sup>3</sup>		mg/m <sup>3</sup>		mg/m <sup>3</sup>	
10	0,1690	-0,20	0,904	0,64	0,755	1,19
19	0,1860	0,79	0,935	1,01	0,666	-0,13
25	0,1760	0,21	0,883	0,40		
30	0,1790	0,38	0,882	0,38	0,719	0,66
44	0,1700	-0,14	0,780	-0,82	0,621	-0,79
55	0,1600	-0,72	0,749	-1,18	0,599	-1,12
56	0,1700	-0,14	0,840	-0,11	0,660	-0,21
58	0,1696	-0,17	0,839	-0,12	0,717	0,63
60	0,1622	-0,60	0,812	-0,44	0,690	0,23
62	0,1600	-0,72	0,790	-0,70	0,620	-0,81
67	0,1730	0,03	0,863	0,16	0,706	0,47
68	0,1800	0,44	1,090	2,83 BE	0,520	-2,29 E
69	0,1841	0,67	0,745	-1,23		
88	0,1698	-0,15	0,850	0,00	0,679	0,06
100	0,1679	-0,26	0,825	-0,29	0,653	-0,32
108	0,1710	-0,08	0,842	-0,09	0,693	0,27
135	0,1710	-0,08	0,779	-0,83	0,584	-1,34
151	0,1680	-0,26	0,862	0,15	0,619	-0,82
167	0,1640	-0,49	0,868	0,22	0,705	0,45
170	0,1670	-0,32	0,836	-0,16	0,597	-1,15
174	0,1600	-0,72	0,830	-0,23	0,688	0,20
186	0,1666	-0,34	0,869	0,24	0,715	0,60
190	0,1960	1,37	0,839	-0,12	0,610	-0,96
191	0,1600	-0,72	0,820	-0,35	0,676	0,02
195	0,1889	0,95	0,923	0,87	< 7,500	
197	0,1710	-0,08	0,860	0,13	0,686	0,17
199	0,1960	1,37	0,901	0,61	0,632	-0,63
205	0,1600	-0,72	0,740	-1,29	0,680	0,08
207	0,1760	0,21	0,825	-0,29	0,706	0,47
208	0,1590	-0,78	0,804	-0,53	0,648	-0,39
214	0,1700	-0,14	0,870	0,24	0,630	-0,66
219	0,1650	-0,43	0,850	0,01	0,691	0,24
224	0,1860	0,79	1,947	12,92 BE	0,819	2,14 E
225	0,1580	-0,84	0,844	-0,06	0,685	0,16
264	0,1700	-0,14	1,000	1,77	0,580	-1,40
267	0,1690	-0,20	0,844	-0,06	0,689	0,22
269	0,1890	0,96	0,887	0,44	0,712	0,56
273	0,1810	0,50	0,915	0,77	0,786	1,65
274	0,1790	0,38	0,911	0,73	0,780	1,56
280	0,1800	0,44	0,860	0,13	0,740	0,97
-	-	--	-	--	-	--
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	40		40		38	
Mean	0,1725		0,849		0,674	
Reproducibility s.d.	0,0102		0,054		0,062	
Rel. reproducibility s.d.	5,89 %		6,34 %		9,16 %	
Reference value	0,1550		0,810		0,675	



	Formaldehyde Z score	Acetaldehyde Z score	Butyraldehyde Z score
Target s.d.	0,0172	0,085	0,067
Rel. target s.d.:	10,00 %	10,00 %	10,00 %
Lower limit of tolerance	0,1380	0,679	0,540
Upper limit of tolerance	0,2069	1,019	0,809
Type B outliers		2	
Number of laboratories with replicates outside of tolerance limits		2	2
No. of laboratories after elimination of outliers type A-D and F (without laboratories that only gave states but no measured values)	40	38	37
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\text{-Score}  > 3,5$			

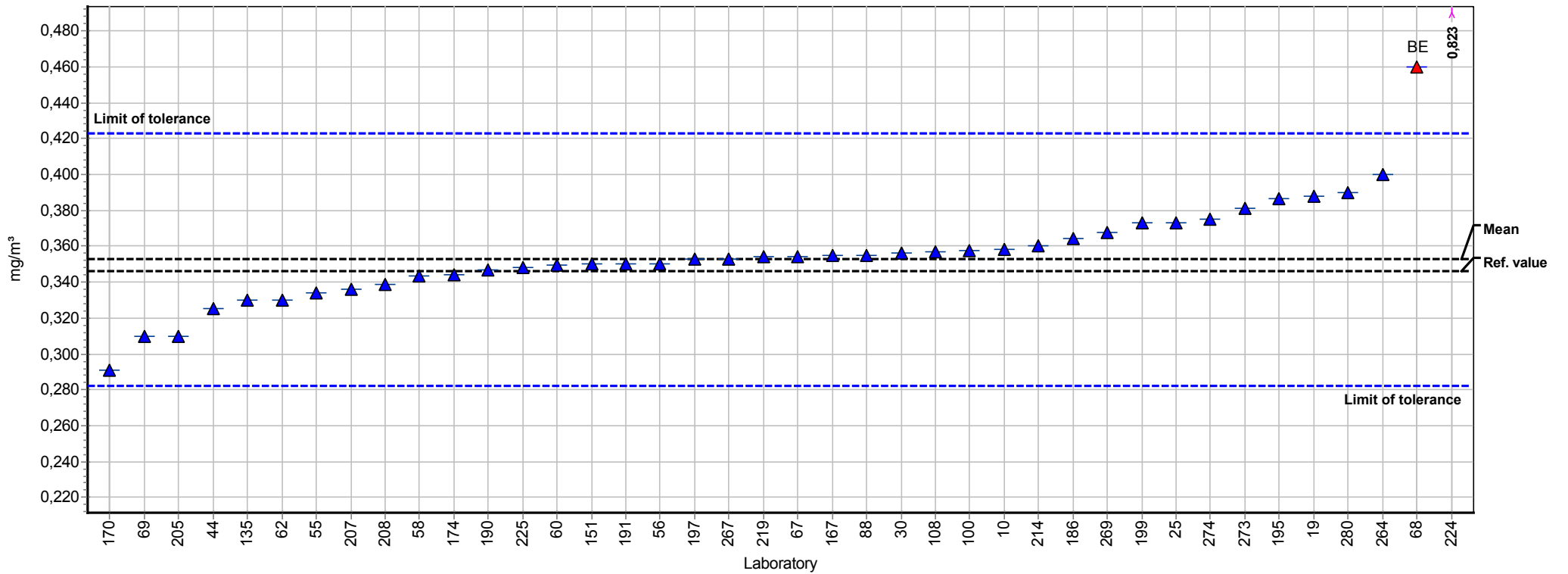
## Summary results

<b>Measurand:</b>	Formaldehyde	<b>Mean:</b>	0,0543 mg/m <sup>3</sup>
<b>Sample:</b>	1	<b>Reproducibility s.d.:</b>	0,0048 mg/m <sup>3</sup>
<b>Method:</b>	ISO 5725-2	<b>Relative reproducibility s.d.:</b>	8,92%
<b>No. of laboratories:</b>	40	<b>Reference value:</b>	0,0490 mg/m <sup>3</sup>
<b>Relative target s.d.:</b>	10,00% (Limited)	<b>Range of tolerance:</b>	0,0435 - 0,0652 mg/m <sup>3</sup> ( Z-Score  <= 2,00)



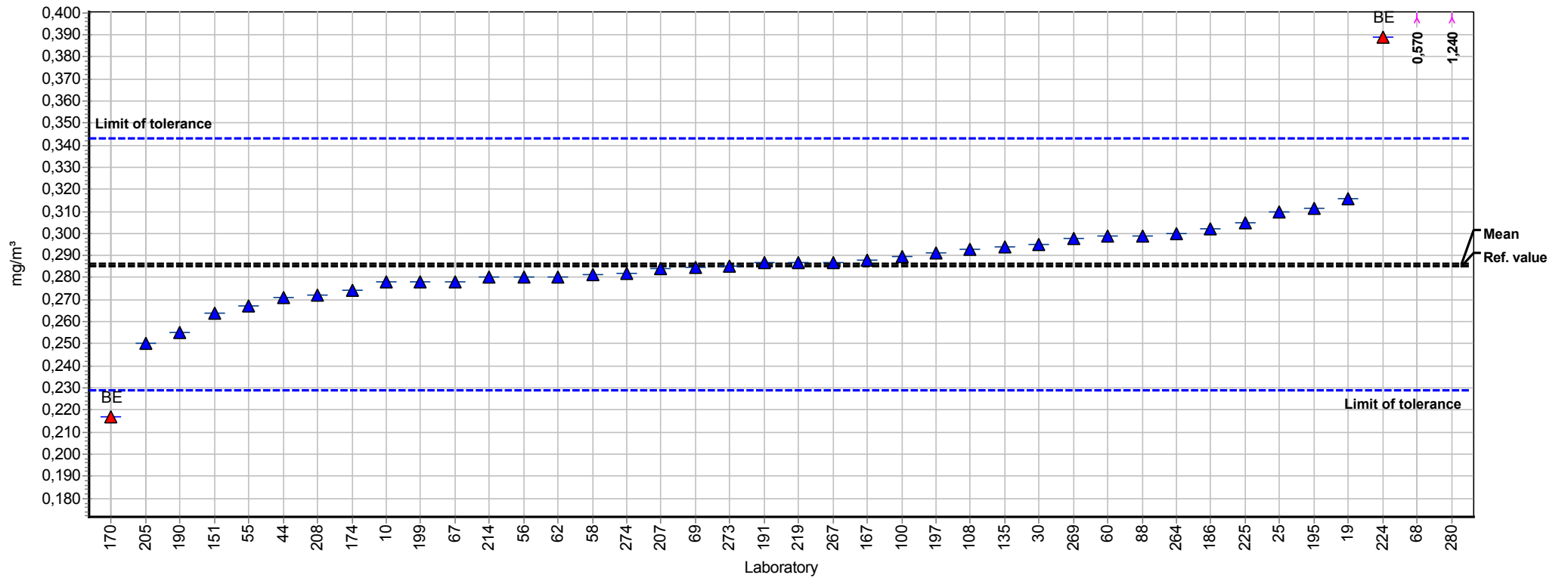
## Summary results

Measurand:	Acetaldehyde	Mean:	0,353 mg/m <sup>3</sup>
Sample:	1	Reproducibility s.d.:	0,023 mg/m <sup>3</sup>
Method:	ISO 5725-2	Relative reproducibility s.d.:	6,43%
No. of laboratories:	38	Reference value:	0,346 mg/m <sup>3</sup>
Relative target s.d.:	10,00% (Limited)	Range of tolerance:	0,282 - 0,423 mg/m <sup>3</sup> ( Z-Score  <= 2,00)



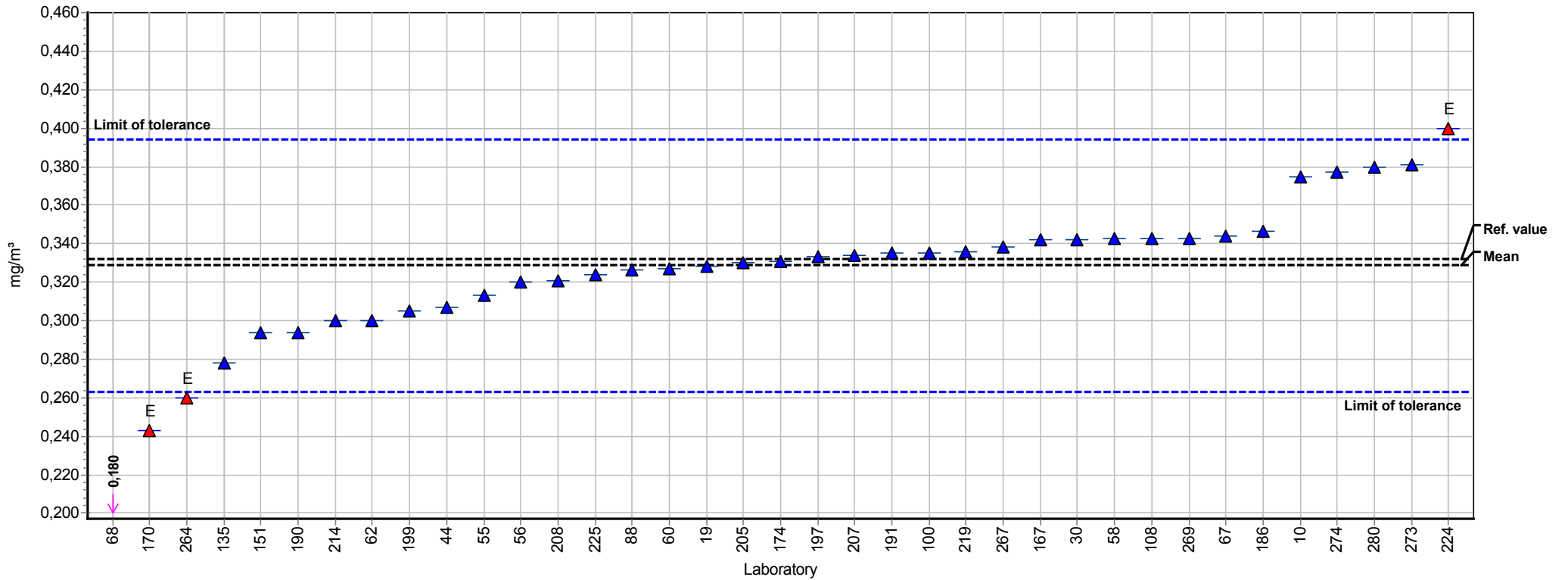
## Summary results

<b>Measurand:</b>	Propionaldehyde	<b>Mean:</b>	0,286 mg/m <sup>3</sup>
<b>Sample:</b>	1	<b>Reproducibility s.d.:</b>	0,015 mg/m <sup>3</sup>
<b>Method:</b>	ISO 5725-2	<b>Relative reproducibility s.d.:</b>	5,18%
<b>No. of laboratories:</b>	36	<b>Reference value:</b>	0,285 mg/m <sup>3</sup>
<b>Relative target s.d.:</b>	10,00% (Limited)	<b>Range of tolerance:</b>	0,229 - 0,343 mg/m <sup>3</sup> ( Z-Score  <= 2,00)



## Summary results

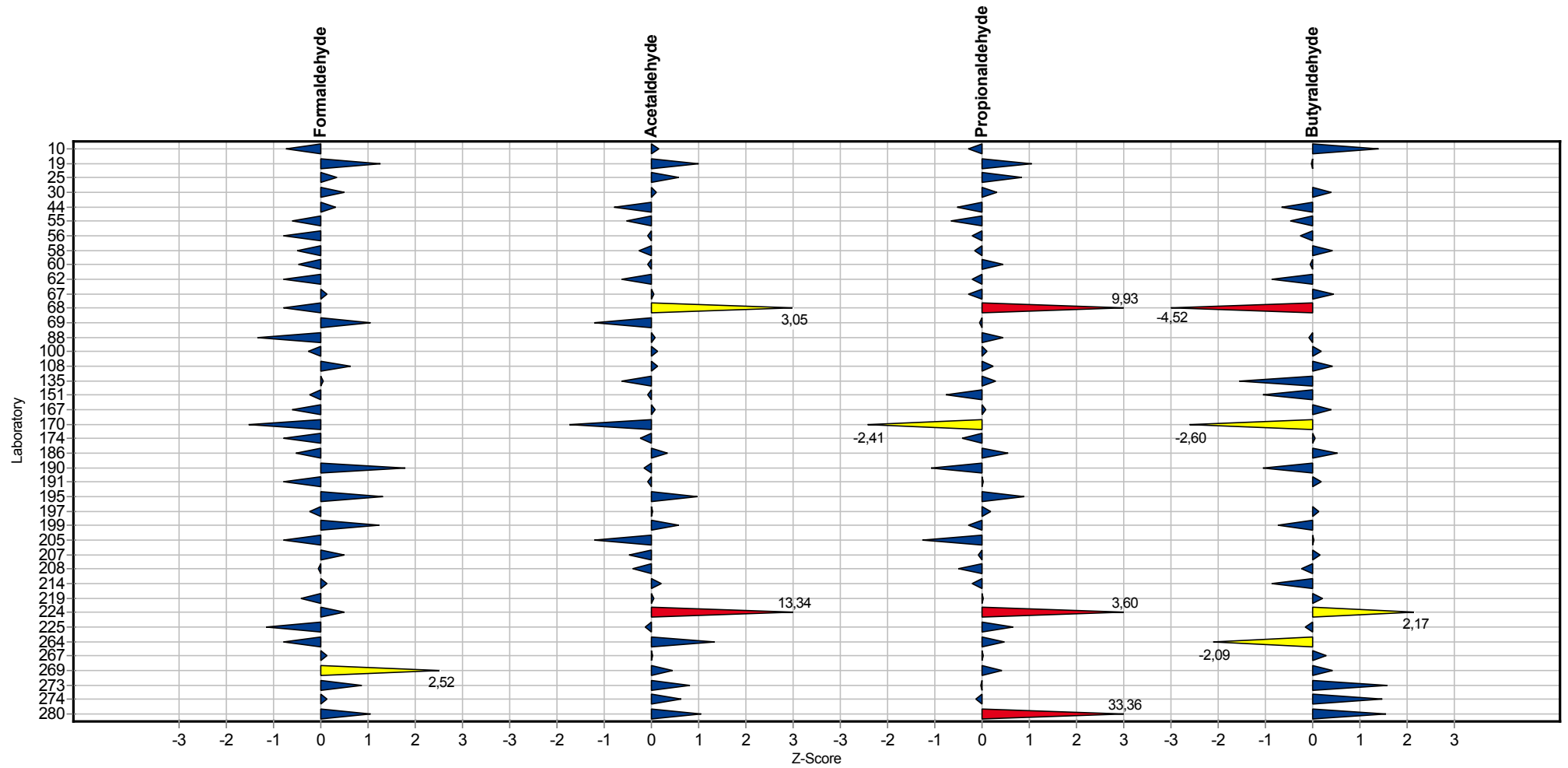
<b>Measurand:</b>	Butyraldehyde	<b>Mean:</b>	0,329 mg/m <sup>3</sup>
<b>Sample:</b>	1	<b>Reproducibility s.d.:</b>	0,032 mg/m <sup>3</sup>
<b>Method:</b>	ISO 5725-2	<b>Relative reproducibility s.d.:</b>	9,87%
<b>No. of laboratories:</b>	36	<b>Reference value:</b>	0,332 mg/m <sup>3</sup>
<b>Relative target s.d.:</b>	10,00% (Limited)	<b>Range of tolerance:</b>	0,263 - 0,394 mg/m <sup>3</sup> ( Z-Score  <= 2,00)



# Sample chart of Z-scores

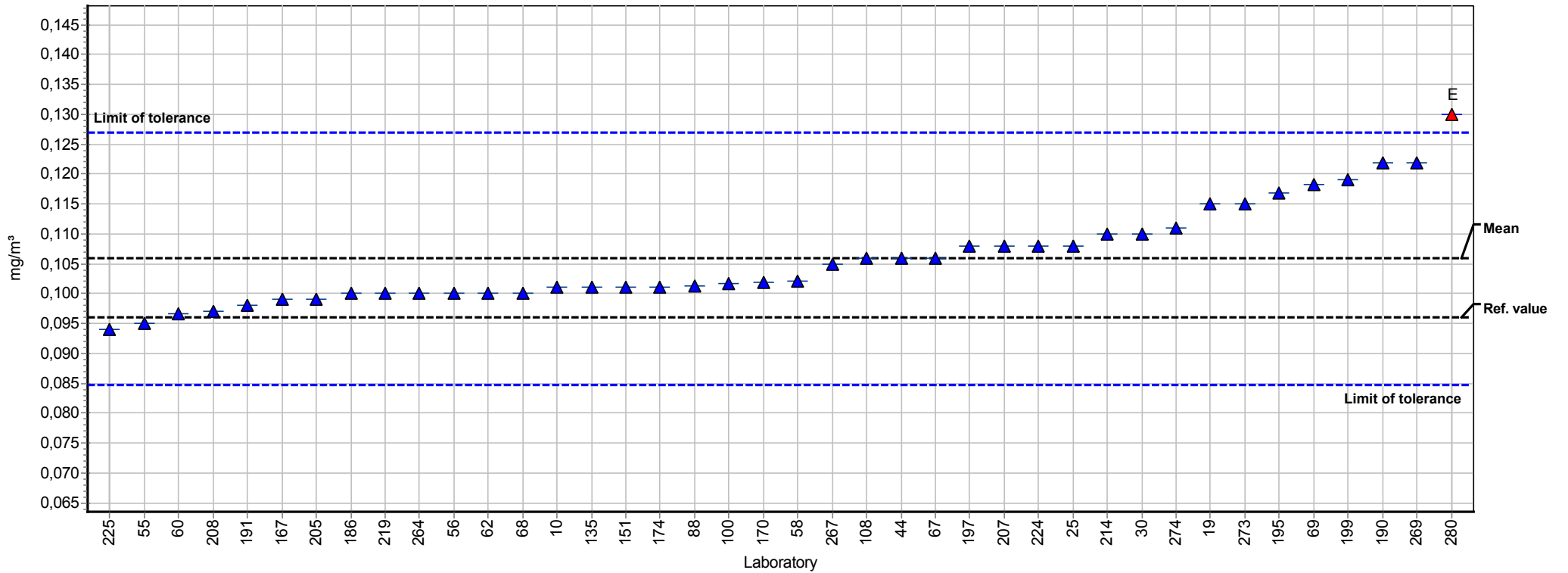
Sample 1

Measurand



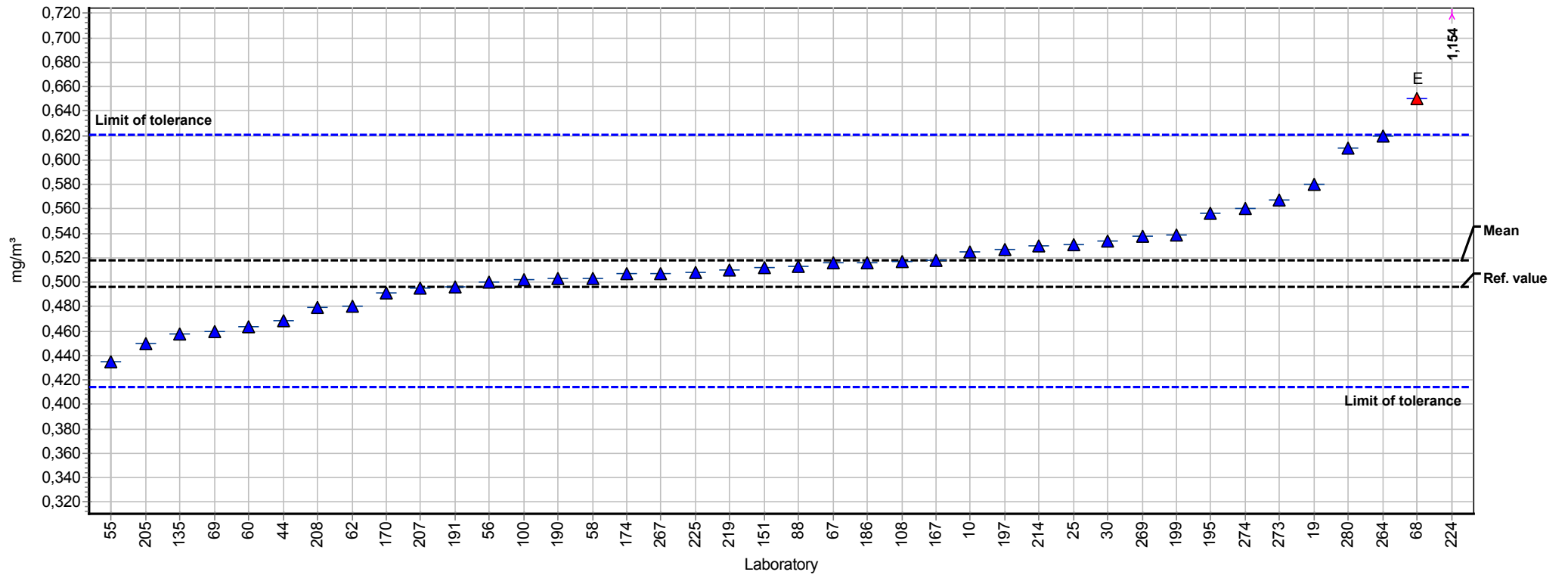
## Summary results

<b>Measurand:</b>	Formaldehyde	<b>Mean:</b>	0,1058 mg/m <sup>3</sup>
<b>Sample:</b>	2	<b>Reproducibility s.d.:</b>	0,0084 mg/m <sup>3</sup>
<b>Method:</b>	ISO 5725-2	<b>Relative reproducibility s.d.:</b>	7,92%
<b>No. of laboratories:</b>	40	<b>Reference value:</b>	0,0960 mg/m <sup>3</sup>
<b>Relative target s.d.:</b>	10,00% (Limited)	<b>Range of tolerance:</b>	0,0847 - 0,1270 mg/m <sup>3</sup> ( Z-Score  <= 2,00)



## Summary results

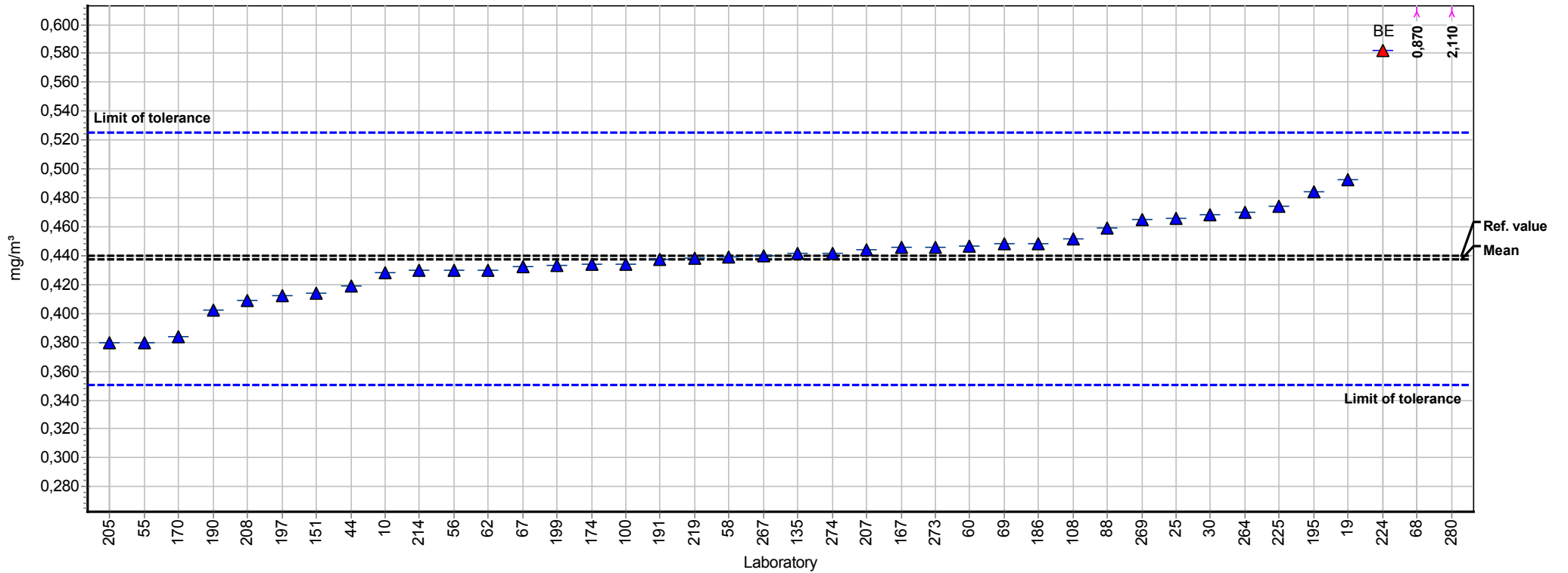
Measurand:	Acetaldehyde	Mean:	0,517 mg/m <sup>3</sup>
Sample:	2	Reproducibility s.d.:	0,045 mg/m <sup>3</sup>
Method:	ISO 5725-2	Relative reproducibility s.d.:	8,73%
No. of laboratories:	39	Reference value:	0,496 mg/m <sup>3</sup>
Relative target s.d.:	10,00% (Limited)	Range of tolerance:	0,414 - 0,621 mg/m <sup>3</sup> ( Z-Score  <= 2,00)





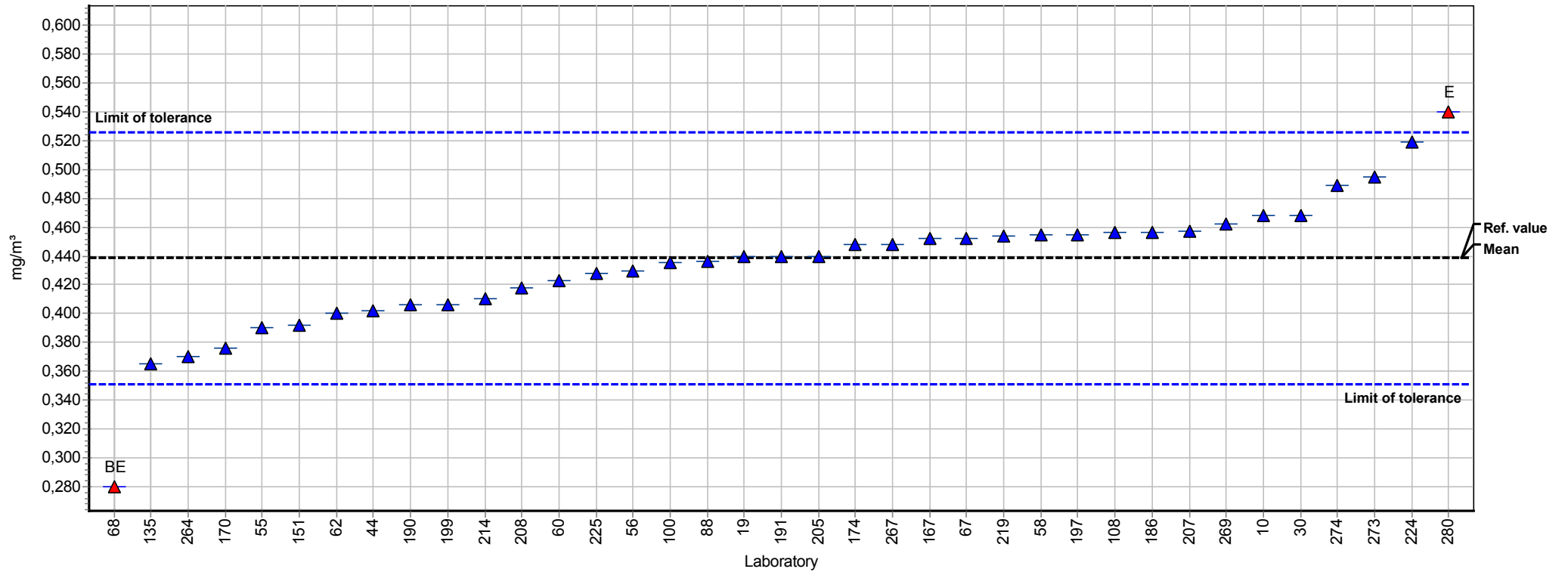
## Summary results

<b>Measurand:</b>	Propionaldehyde	<b>Mean:</b>	0,438 mg/m <sup>3</sup>
<b>Sample:</b>	2	<b>Reproducibility s.d.:</b>	0,026 mg/m <sup>3</sup>
<b>Method:</b>	ISO 5725-2	<b>Relative reproducibility s.d.:</b>	5,99%
<b>No. of laboratories:</b>	37	<b>Reference value:</b>	0,440 mg/m <sup>3</sup>
<b>Relative target s.d.:</b>	10,00% (Limited)	<b>Range of tolerance:</b>	0,350 - 0,525 mg/m <sup>3</sup> ( Z-Score  <= 2,00)



## Summary results

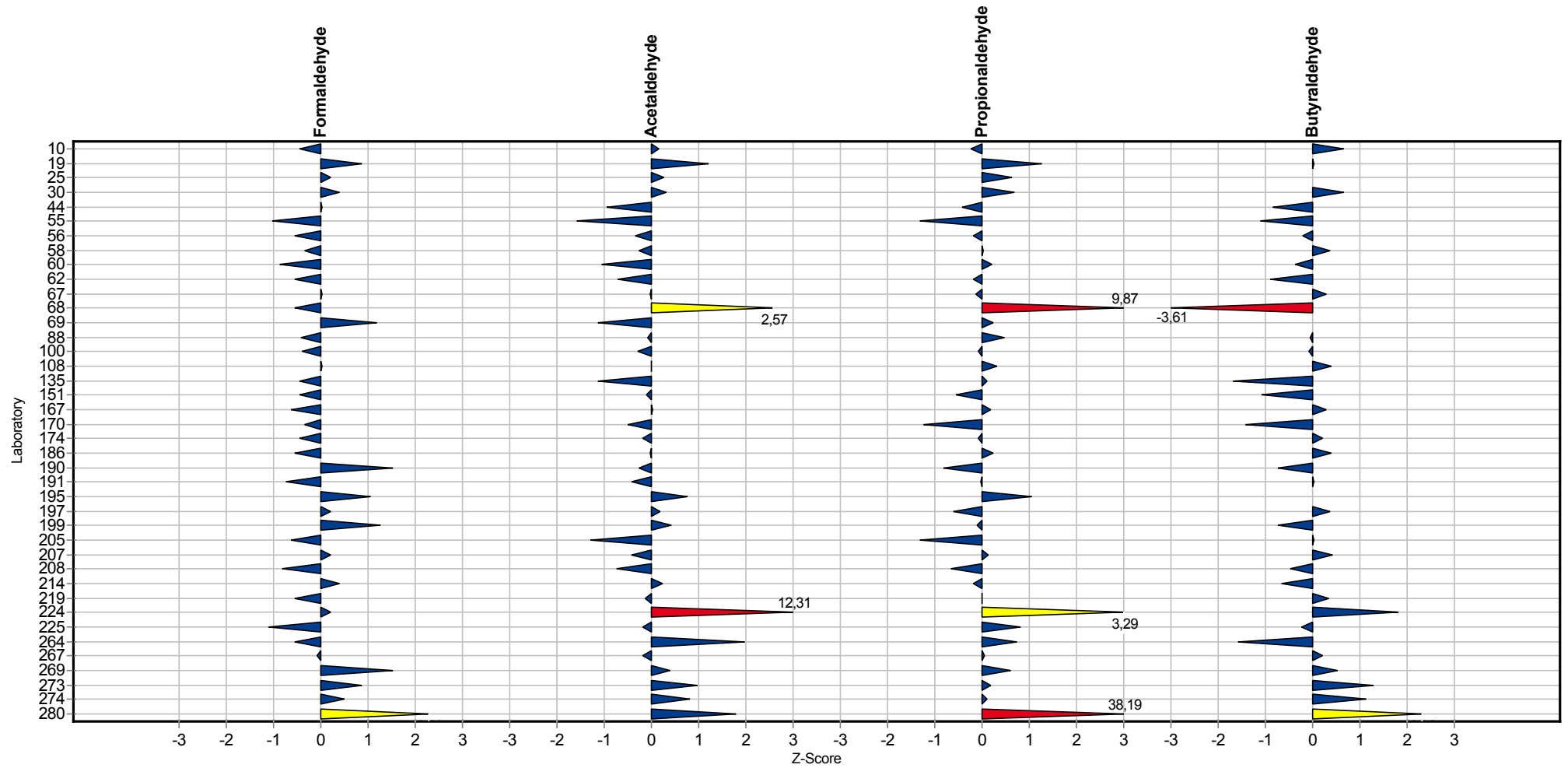
<b>Measurand:</b>	Butyraldehyde	<b>Mean:</b>	0,438 mg/m <sup>3</sup>
<b>Sample:</b>	2	<b>Reproducibility s.d.:</b>	0,039 mg/m <sup>3</sup>
<b>Method:</b>	ISO 5725-2	<b>Relative reproducibility s.d.:</b>	8,81%
<b>No. of laboratories:</b>	36	<b>Reference value:</b>	0,439 mg/m <sup>3</sup>
<b>Relative target s.d.:</b>	10,00% (Limited)	<b>Range of tolerance:</b>	0,351 - 0,526 mg/m <sup>3</sup> ( Z-Score  <= 2,00)



# Sample chart of Z-scores

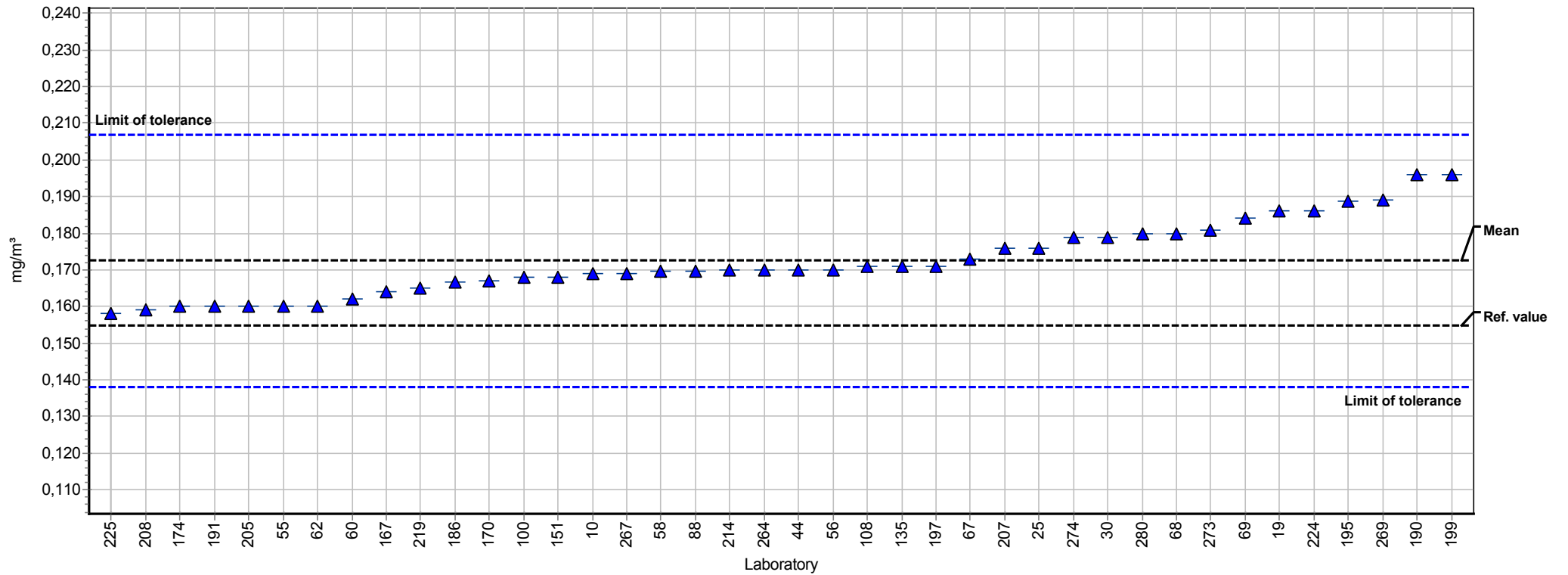
Sample 2

Measurand



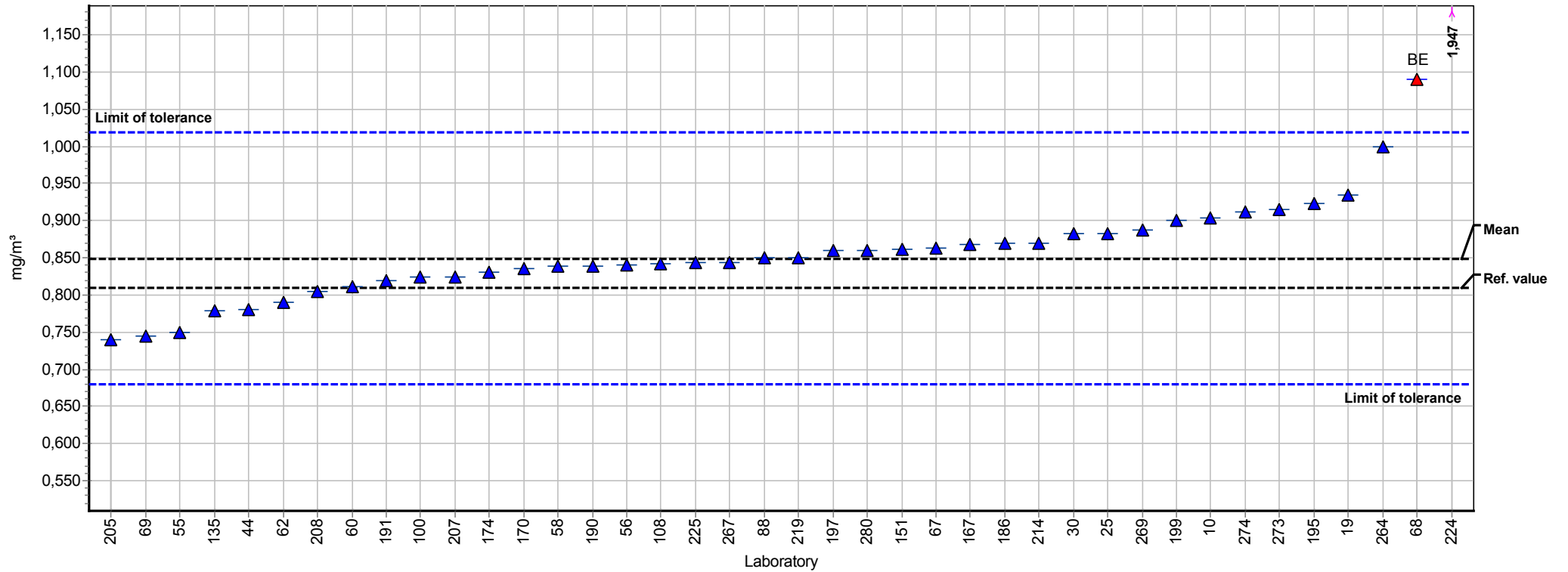
## Summary results

<b>Measurand:</b>	Formaldehyde	<b>Mean:</b>	0,1725 mg/m <sup>3</sup>
<b>Sample:</b>	3	<b>Reproducibility s.d.:</b>	0,0102 mg/m <sup>3</sup>
<b>Method:</b>	ISO 5725-2	<b>Relative reproducibility s.d.:</b>	5,89%
<b>No. of laboratories:</b>	40	<b>Reference value:</b>	0,1550 mg/m <sup>3</sup>
<b>Relative target s.d.:</b>	10,00% (Limited)	<b>Range of tolerance:</b>	0,1380 - 0,2069 mg/m <sup>3</sup> ( Z-Score  <= 2,00)



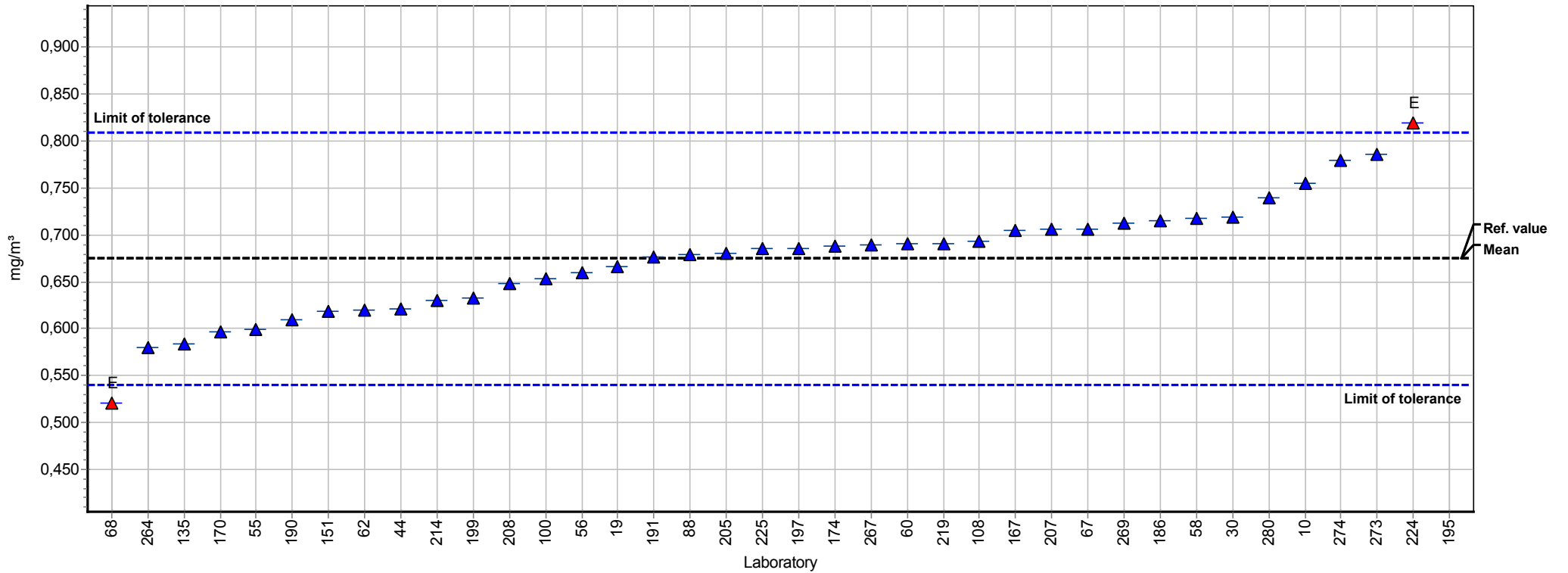
## Summary results

Measurand:	Acetaldehyde	Mean:	0,849 mg/m <sup>3</sup>
Sample:	3	Reproducibility s.d.:	0,054 mg/m <sup>3</sup>
Method:	ISO 5725-2	Relative reproducibility s.d.:	6,34%
No. of laboratories:	38	Reference value:	0,810 mg/m <sup>3</sup>
Relative target s.d.:	10,00% (Limited)	Range of tolerance:	0,679 - 1,019 mg/m <sup>3</sup> ( Z-Score  <= 2,00)



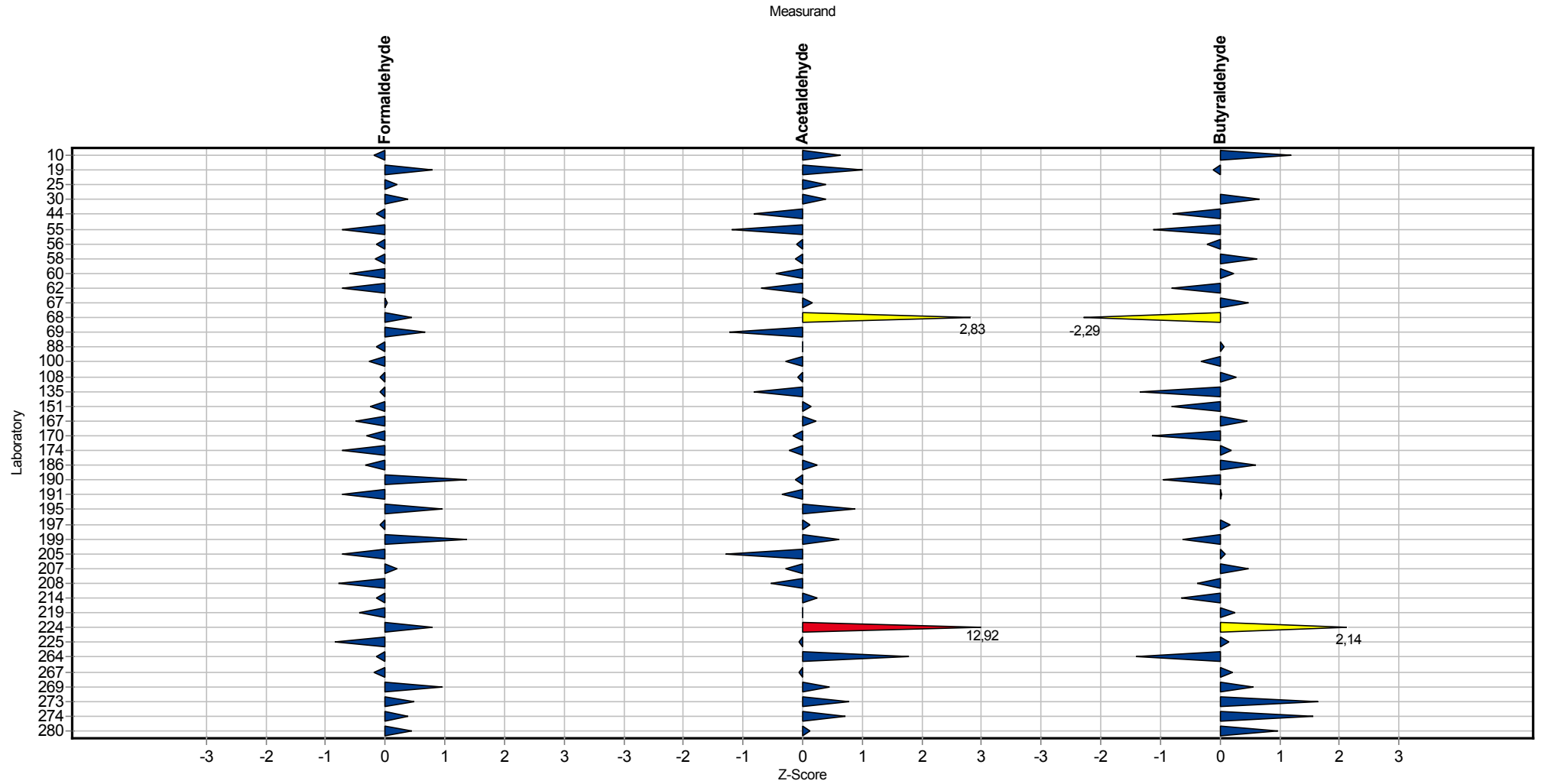
## Summary results

Measurand:	Butyraldehyde	Mean:	0,674 mg/m <sup>3</sup>
Sample:	3	Reproducibility s.d.:	0,062 mg/m <sup>3</sup>
Method:	ISO 5725-2	Relative reproducibility s.d.:	9,16%
No. of laboratories:	37	Reference value:	0,675 mg/m <sup>3</sup>
Relative target s.d.:	10,00% (Limited)	Range of tolerance:	0,540 - 0,809 mg/m <sup>3</sup> ( Z-Score  <= 2,00)



# Sample chart of Z-scores

Sample 3



## Questions and Answers

Participant	kind of tube
10	Sigma-Aldrich
19	gestellt
25	Supelco LpDNPH S 10
30	LpDNPH S10 cartridge (batch number 6738902)
44	Waters Sep-Pak XPoSure
55	Waters Sep-Pak
56	Waters Sep-pak
58	DNPH cartridge waters
60	
62	Water Sep Pak
67	LpDNPH S10 Cartridge lot.n° 6738902 3 mL, 350mg SPE Tube
69	Waters Sep-Pak XPoSure
88	Supelco LpDNPH S 10
100	chemical desorption
108	Supelco LpDNPH S10 Cartridge 3ml, 350 mg SPE Tube 21014
135	SUPELCO DNPH-Kartuschen
151	WATERS DNPH SEP-PAK
167	Waters Sep-Pak XPoSure
170	
174	cartridge
186	Waters Sep-Pack
190	Supelco LpDNPH S 10
191	waters Sep-Pak
195	Acetonitrile
197	Sigma Aldrich LpDNPH S 10 Cartridge
199	Supelco LpDNPH S10 350mg/3mL
205	Waters Sep-Pak DNPH-Kartuschen
207	LP-DNPH S10 Kartuschen
214	DNPH Filter
219	Waters Sep-Pak XPoSure
224	Sigma-Aldrich DNPH S10 Cartridge



## Round-robin test Aldehydes 2015

Participant	kind of tube
225	Lp DNPH S10 Cartridge Lot No. 6738902
264	
267	LpDNPH Sigma 21014
269	Supelco LpDNPH S 10
273	Supelco LpDNPH S10
274	Supelco LpDNPH S 10
280	Waters Sep-Pak XPasure

Participant	Analytical method
10	HPLC-DAD
19	BGIA 6045
25	eigene Prüfmethode
30	ISO 16000-3
44	ISO 16000-3
55	HPLC-photodiode array detector
56	UPLC
58	LC
60	ISO 16000-3
62	NF X43-264
67	method derived from NIOSH 2016 and NIOSH 2018
69	HPLC
88	ISO 16000-3 (HPLC)
100	HPLC
108	DIN/ISO 16000-3
135	IFA-Arbeitsmappe 6045
151	UHPLC PDA
167	HJPLC
170	ISO 16000/3
174	HPLC/UV
186	NF EN ISO 16000-3
190	IFA 6045
191	ANA-033

## Round-robin test Aldehydes 2015

Participant	Analytical method
195	NIOSH 2016
197	BGIA 6045
199	in Anlehnung an DIN ISO 16000-3:2013-01
205	DIN ISO 16000-3
207	HPLC-DAD
214	DIN ISO 16000-3
219	HPLC
224	HPLC-UV
225	Greim, H. (Hrsg) (1998) Analytische Methoden zur Prüfung gesundheitsschädlicher Arbeitsstoffe, Luftanalysen. Band 1. Aldehyde, Methode Nr. 2, Luftanalyse/HPLC, WILEY-VCH-Verlag, Weinheim
264	HPLC/UV
267	interne Methode SOP-B-35
269	IFA 6045
273	ISO 16000-3
274	ISO 16000-3
280	HPLC/DAD

Participant	date start sample preparation	Storage time after desorption	Date of analysis
10	09/25/2015	1 day Refrigerator	09/26/2015
19	02.10.2015	TK/-18°C	13.10.2015
25	05.10.2015	Analyse direkt nach Desorption	05.10.2015
30	01/10/2015	refrigerator	2/10/2015 and 15/10/2015 (after dilution)
44	2015/10/21	15days,4degree,refrigerator	2015/10/21
55		3 days refrigerator	28/09/2015
56	2015/09/25	3 days - refrigerator	2015/09/28
58	October 5	from receipt in fridge	October 5
60	28/09/2015	1h à 20°C	28/09/2015
62	02/10/2015	0	02/10/2015
67	I started on the 9th of October 2015	I analyzed samples immediately after desorption. The desorption solutions remaining was put in a refrigerator.	I analyzed the samples on the 9th of October 2015
69	05/10/15	-20 °C in Freezer	05/10/15
88	30/09/2015	1 week (2d post package - no cooling, 5d freezer and 6-12h refrigerator)	sample 1: 30/09/2015, sample 2 & 3: 01/10/2015
100	09/25/2015	12h in room temperature	09/26/2015
108	25.09.2015	RT im Autosampler der HPLC	25.09.2015

### Round-robin test Aldehydes 2015

Participant	date start sample preparation	Storage time after desorption	Date of analysis
135	28.09.2015	sofortige Messung	28.09.2015
151	25/9/15	No Storage	25/9/15
167	28/10/2015	30 min for first sample	28/10/2015
170	06.10.2015	nein	07.10.2015
174	26/10/15	one day	27/10/15
186	28-09-2015	No	28-09-2015
190	16.10.2015	nein	16.10.2015
191	02/10/15	none	02 and 03/10/15
195	19/10/2015	0	21/10/2015
197	28.09.2015	ja, 48 h im Kühlschrank	30.09.2015
199	06.10.2015	NEIN	06.10.2015
205	28.9.2015		28.9. - 20.10.2015
207	06.10.2015	-	06.10.2015
214	28.09.2015	nein, gleich gemessen	28.09.2015
219	2015-09-24	Refrigerator overnight	2015-09-25
224	9/10/15	none	9/10/15
225	29.09.2015	nein	29.09.2015
264	25/09/15	<1 day in refrigerator	25/09/15
267	25/09/2015	0 Tage	25/09/2015
269	29.9.15	nein	29.9.15
273	30th Sep 2015	No storage, analyze immediatly after desorption	30th Sep 2015
274	29th Sep 2015	No storage, analyze immediatly after desorption	30th Sep 2015
280	05/10/2015	11 jours - Firgo	06/10/2015

Participant	Desorption solution	Volume of desorption solution
10	Acetonitrile	3 mL
19	Acetonitril	5
25	Acetonitril	10 ml
30	acetonitrile	5 ml
44	ACN	5.0
55	ACN	3
56	Acetonitrile	5 mL

**Round-robin test Aldehydes 2015**

Participant	Desorption solution	Volume of desorption solution
58	acetonitril	10
60	ACN	3 mL
62	Acetonitrile	5
67	Acetonitrile was the desorption solution.	10 ml
69	Acetonitrile	5 ml
88	Acetonitrile	5 ml
100	acetonitrile	4 ml
108	Acetonitril	5 ml
135	Acetonitril	2 ml
151	Acetonitrile	3ml added to tube approx 2.5 ml eluted and collected
167	Acetonitrile (AcN)	6 mL (filled to 10 mL with distilled water)
170	Acetonitril	5 ml
174	acetonitrile	5
186	ACN	10mL
190	Acetonitril	5
191	ACN	5
195	Aceonitrile	5
197	Acetonitril	10
199	Acetonitril	3mL
205	Acetonitril	3 ml
207	ACN/H2O 60/40 + 5mmol (NH4) HCO3	5 ml
214	Acetonitril	5 ml
219	Acetonitrile	10ml
224	Acetonitril	5
225	Acetonitril	5 mL
264	Acetonitrile	5 mL
267	Acetonitrile	5 ml
269	Acetonitril	10
273	ACN	5 mL
274	ACN	5mL
280	ACN	2 mL

## Round-robin test Aldehydes 2015

Participant	Chromatography system
10	Perkin Serie 200-DAD
19	Agilent 1200
25	Agilent 1260 Quad Pump, 1260 MWD VL, 1260 ALS
30	Waters 2695+Waters2995
44	Waters-UPLC-PDA detector
55	Acquity Waters UPLC system
56	Thermo ultimate 3000 :pump LPG-3400RS, detector UV DAD-3000RS, sampler WPS-3000TRS
60	Agilent 1260 Affinity
62	thermostatically controlled autosampler Agilent 1200 G1329A & G1330B / Quat. pump Agilent 1200 G1311A / UV detector Perkin Elmer
67	I used a quaternary pump (HP 1100 G1311A), a UV-Vis DAD (HP 1100 G1315A) and an autosampler (HP ALS 1100 G1313A)
69	Injectore automático L-2200, Detector UV-Visible L2420 Hitachi
88	Pump 'Accela 600', Detector 'Accela PDA 80', Sampler 'Accela Autosampler'
100	binary pump/DAD detector/automatic sampler
108	Agilent 1260 Infinity G1312B/1290DAD Zelle G4212-60007/1260ALS/
135	Agilent 1100 Series
151	Acquity H class
167	Perkin Elmer Series 200 LC Pump / Waters 2487 Dual Absorbance Detector / Waters 717 Autosampler
170	Shimadzu SPD-M20A Dioden Array Detektor
174	UV
186	HPLC-PAD Waters
190	Agilent 1100
191	Waters Alliance 2690
195	PERKIN ELMER SERIES 200 DAD
197	Agilent 1100-System (inkl. Autosampler), DAD-Detektor
199	Agilent 1200 Series
205	Agilent 1100 System
207	Agilent 1260 Infinity LC DAD
214	Agilent LC 1100 / binäre Hochdruck-Gradientenpumpe / DAD / Autosampler ja
219	Agilent
224	Acquity Waters UPLC system
225	PerkinElmer quaternäre Pumpe Series 200, PerkinElmer DAD-Detektor Series 200EP, PerkinElmer Autosampler SER225
264	Shimadzu Nexera i-series
267	Agilent 1260, DAD
269	Fa. Thermo

## Round-robin test Aldehydes 2015

Participant	Chromatography system
273	Agilent 1200 HPLC, Agilent 6430 LCMSMS
274	Agilent 1260HPLC, Agilent 6430 LCMSMS
280	Alliance 2695

Participant	Analytical column	mobile phase
10	Brownlee Validated C18	ACN/H2O (70/30)
19	C18, 5 µm, 15x4,6	Acetonitril/Wassr
25	Agilent ZORBAX Eclipse Plus C18, 4.6 x 100mm, 3.5-Micron	A: Acetonitril/Tetrahydrofuran/Wasser (60/10/30) + B: Acetonitril/Wasser (60/40)
30	Allure Ak 250x4.6mm 5 µm	Acetonitril / Water
44	ACQUITY UPLC BEH C18 1.7µm 2.1*50mm	ACN-water
55	Waters Acquity UPLC BEH Phenyl	gradient elution of 10% THF in water and acetonitril
56	Acclaim RSLC Carbonyl 2,2 µm, 2,1*100 mm	Water/Acetonitrile
60	Allure C18 5 µm 150 * 4.6 mm	ACN/H2O
62	Ascentis RP-Amide HPLC Column	acetonitrile/water
67	I used a Alltech - Alltima C18 3u particles, 150 mm x 3.2 mm	Acetonitrile/Water
69	Columna Ascentis RP-Amide, 25 cmx4,6 mm ;	Acetonitrilo/ agua
88	Restek LC Allure C18	Water 15%, Methanol 85%
100	column ALLURE AK RESTEK	acetonitrile / water
108	Restek Raptor Biphenyl 2,7 µm 150*3.0 mm	Wasser/Methanol
135	M&N EC 250/4.6 Nucleodur 100-5-C18ec	Wasser - Acetonitril - Tetrahydrofuran
151	Waters BEH C18 2.1 x 100mm 1.7µm + Van Guard	60% water 40 % acetonitrile
167	Waters Symmetry C18, 3,5 µm, (4,6 x 100) mm Cartridge + Waters µBondapak C18, 10 µm	AcN with 0,1 % Phosphoric Acid and water with 0,1 % Phosphoric ACid
170	Restek Allure AK; 4.6x200 mm, 5µm; 60A	A: Wasser; B: Acetontril
174	C18	acetonitrile/water
186	Waters NOVAPACK C18 / 150nm*3.9nm*4µm	water/ANC/THF
190	Thermo Hypersil 150x4,6 5µm	ACN/Wasser
191	waters symetry C18	H2O-THF-ACN
195	Ascentis Express C18 (150 mm x 4.6 mm x 3 µm)	ACN:H2O (30:70)
197	Phenomenex Luna 3µ C18(2) 250x4,6mm	Acetonitril/Wasser
199	Phenomenex Kinetex C18; 150x4,6mm; 5µm	A: Wasser; B:Acetonitril
205	Waters Nova Pak C18; 150 mm x 3,9 mm x 4 µm	Wasser / Acetonitril
207	Phenomenex Kinetex 2,6µm 100*4,6mm	ACN/ THF H2O

## Round-robin test Aldehydes 2015

Participant	Analytical column	mobile phase
214	Säule Kinetex 2.6 u C18 100A 100 x 3.00 mm	Acetonitril / Reinstwasser
219	Silica C18	A: Water B: Acetonitrile
224	kinetex 5µ c18 100A	60/40 (ACN / H2O)
225	Kromasil 100 C18 5 µm / 250 x 3,0 mm	A: Acetonitril B: Wasser
264	Acclaim Carbonyl	ACN/Buffer
267	Symmetry C18, 250mm x 4.5mm x 5µm (Waters)	Acetonitrile/Wasser
269	LiCHroCART 250-4	Acetonitril/Wasser
273	Kinetex C18 narrow-bore column 4.6 x 100 mm, 2.6 µm	ACN, 10mM Ammonium Acetate adjust to pH3.6
274	Kinetex C18 narrow-bore column 4.6*100mm, 2.6 µm	ACN, 10mM Ammonium Acetate adjust to pH3.6
280	Ultra C18 150x 4.6 x 5 µm	Eau/ACN 1/1000 H3PO4

Participant	Gradient-/ Temp.-program	Flow rate
10	No	1 ml/min
19		1
25	100 % A für 1 min, dann Gradient linear bis 21.5 min auf 90 % A	1,5 ml/min
30	0 min 55/45 18min 64/36 22min 70/30 32 min 100/0	1.2
44	25%ACN 75%Water---80%ACN 20%Water----25%ACN 75%Water	0.5
55	40°C	0.5
56	0 min 52% ACN 48% Water ; 6min 52% ACN 48% Water ; 15min 100% ACN ; 17min 100% ACN	0.4 mL/min
60	pas de gradient	1 mL/min
62	7 min 60/40 - 15 min 75/25 - 18 min 100/0	1mL/min
67	Gradient: time 0 - 40% water/60% acetonitrile, time 6.50 - 0% water/100%acetonitrile. Stop time @ 12 min. Temperature 28°C	0.6 ml/min
69	Time0: 40% Aceton 60% agua; time 5min: 40% acet 60% agua; time 25min: 61% acetoni 39% agua; time 40min: 75%aceton 25%agua	1,5 ml/min
88	30°C	500 ml/min
100	start : 40%water-60%ACN end : 100%ACN - temperature : 40°C	1.8ml/min
108	hauseigener Gradient	0,55 ml/min
135	Isokratisch: Eluent A 80% (65% H2O / 25% ACN / 10% THF) : Eluent B 20% Acetonitril	2,5 ml/min
151	Isochratic	0.5
167	Water / AcN 45 / 55 (3 min), up to AcN 100 in 4 min. Back to water / AcN 45 / 55 in 1 min.	1,5 mL/min
170	65% auf 70% in 15 min; 70% auf 100% in 5 min	1
174	none	1
186	Mobile phase Gradient - 35°C	1.5mL/min

## Round-robin test Aldehydes 2015

Participant	Gradient-/ Temp.-program	Flow rate
190	35 % ACN bis 30 min auf 60 % bis 40 min 90 % ACN	1,5 ml/min
191	-	1.2
195	5 min., isocratic ACN:H2O (30:70), 35 min. gradient ACN:H2O (50:50), 15 min. gradient ACN:H2O (70:30), 5 min. return gradient ACN:H2O (30:70)	0.80
197	0 Min: 40% ACN/60% H2O, bis 20 Min auf 70% ACN/30% H2O, bis 25 Min auf 100% ACN, bis 27 Min 40%ACN/60% H2O	1,5
199	0min= A60%, B:40%; 15min= A:50%, B:50%; 17min= A:50%, B:50%; 20min= A:43%, B:57%; 30min= A:43%, B:43%; 45min= A:0%, B:100%; 50min= A:0%, B:100%	0,8ml/min.
205		0,7 ml/min
207		1,5 ml /min
214	Raumtemperatur, Time 0 - 2 Min. 30% ACN // von 2 Min - 23 Min auf 55% ACN / 23 Min - 24 Min 55% ACN halten / von 24 Min - 27 Min 30 % ACN / von 27 Min bis 30 Min 30 % ACN halten	0.60 ml
219	Constant temp 35C, 6 min gradient	0.4
224	2min 60/40 7min 5/95 1 min 60/40 45°C	1.2
225	0 bis 2 min 50% A; 2 bis 12 min linear auf 97,5% A; 12 bis 22 min 97,5% A; 22 bis 24 min linear auf 50% A; [der jeweilige rest auf 100% ist B]	0,6 mL/min
267	40/60 H2O-Acetonitrile 7 min., 100% Acetonitrile 20min.	1,5 ml
269	65/35, 80/20, 65/35	1,0
273	Room Temp. Isocratic at 40% ACN for 1 min, increase to 85% ACN in following 8 mins, isocratic at 85% ACN for following 5 mins, decrease to 40% ACN and flush for another 6 mins	0.6 mL/min
274	40centigrade, Isocratic at 40% ACN for 1 min, increase to 85% ACN in following 8 mins, isocratic at 85% ACN for following 5 mins, decrease to 40% ACN and flush for another 6mins	0.6 mL/min
280	45/55	1 mL/min

Participant	Wavelength	Recovery rate
10	365	
19	365 nm	nein
25	360 nm	nein
30	360	No
44	360nm	no
55	360 nm	yes
56	360 nm	No
60	360	non
62	360 nm	no
67	I used 360 nm wavelength.	No, my result didn't include rec. rates
69	Uv-visible	No
88	360 nm	100.25% recovery rate with respect to 15 ppm standard
100	360 nm	no
108	350nm, BW 20 nm, Ref WL 550 nm, BW 50 nm	wdf war 100+/- 3% und wurde daher nicht berücksichtigt



### Round-robin test Aldehydes 2015

Participant	Wavelength	Recovery rate
135	365 nm	nein
151	360nm	no
167	360 nm	100 ± 1 %
170	360 nm	nein
174	350 nm	yes (100%)
186	360 nm	yes
190	365 nm	nein
191	360	-
195	360 nm	100%
197	365 nm	nein
199	370nm	NEIN
205	365 nm	
207	360 nm	
214	360 nm	nein
219	360 nm	No
224	360 nm	no
225	360 nm	nein
264		Yes
267	365	nein
269	365	ja, lt. IFA 6045
273	350 nm	No
274	350nm	No
280	360 nm	non