

Summary of laboratory means

sample 1

Laboratory	FORMALD	Z score	ACETALD	Z score	PROPALD	Z score	BUTYRALD	Z score	ACROLEIN	Z score
Measurement unit	mg/m ³		mg/m ³		mg/m ³		mg/m ³		mg/m ³	
–	–	–	–	–	–	–	–	–	–	–
29	0,071	-1,136	0,185	-0,704	0,187	-0,612				
65	0,087	0,896	0,217	0,888	0,197	-0,101	0,188	-0,222	0,012	
68	0,010	-8,752	0,080	-5,980	0,060	-6,988	0,140	-2,723		
108	0,081	0,113	0,203	0,201	0,203	0,191	0,197	0,239	0,083	
122	0,063	-2,135	0,100	-4,975	0,105	-4,729	0,102	-4,698	0,100	
123	0,078	-0,262	0,200	0,050	0,202	0,141	0,200	0,395	< 0,020	
186	0,077	-0,387	0,208	0,452	0,204	0,241	0,205	0,655	0,009	
205	0,083	0,362	0,190	-0,453	0,200	0,040	0,200	0,395		
208	0,067	-1,635	0,182	-0,855	0,170	-1,466	0,161	-1,632	0,083	
221	0,088	0,962	0,200	0,070	0,215	0,773	0,205	0,645	0,023	
243	0,100	2,485	0,050	-7,488	0,540	17,109	0,220	1,435		
267	0,086	0,737	0,206	0,351	0,215	0,793	0,208	0,811	0,020	
281	< 0,294									
–	–	–	–	–	–	–	–	–	–	–
Method	ISO 5725		ISO 5725		ISO 5725		ISO 5725		ISO 5725	
Assessment	Z ≤2,000		Z ≤2,000		Z ≤2,000		Z ≤2,000		Z ≤2,000	
Mean	0,080		0,199		0,199		0,192			
Reproducibility s.d.	0,011		0,011		0,014		0,024			
Rel. reproducibility s.d.	13,16 %		5,69 %		6,96 %		12,50 %			
Reference value	0,078		0,208		0,198		0,199		0,118	
Target s.d.	0,008		0,020		0,020		0,019			
Rel. target s.d.	10,00 %		10,00 %		10,00 %		10,00 %			
Lower limit of tolerance	0,064		0,159		0,159		0,154			
Upper limit of tolerance	0,096		0,239		0,239		0,231			

Laboratory	FORMALD	Z score	ACETALD	Z score	PROPALD	Z score	BUTYRALD	Z score	ACROLEIN	Z score
Type B outliers	1		0		2		0			
Type F outliers	0		3		1		1			
No. of laboratories after elimination of outliers type A-D and F (without laboratories that only gave states but no measured values)	11		9		9		10			
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: $ \text{Score} > 3,5$										

Summary of laboratory means

sample 2

Laboratory	FORMALD	Z score	ACETALD	Z score	BUTYRALD	Z score
Measurement unit	mg/m ³		mg/m ³		mg/m ³	
–	–	–	–	–	–	–
29	0,047	-0,535	0,821	-0,320		
65	0,054	0,790	0,976	1,509	0,689	0,692
68			0,270	-6,817	0,470	-2,711
108	0,054	0,874	0,908	0,705	0,752	1,662
122	0,061	2,284	0,428	-4,954	0,347	-4,619
123	0,049	-0,133	0,903	0,646	0,718	1,135
186	0,035	-2,952	0,638	-2,478	0,513	-2,044
205	0,052	0,472	0,850	0,022	0,680	0,546
208	0,040	-1,945	0,909	0,717	0,646	0,019
221	0,051	0,270	0,610	-2,813	0,489	-2,422
243	0,070	4,096	0,990	1,672	0,780	2,097
267	0,054	0,874	0,877	0,340	0,711	1,027
281	< 0,300					
–	–	–	–	–	–	–
Method	ISO 5725		ISO 5725		ISO 5725	
Assessment	Z <=2,000		Z <=2,000		Z <=2,000	
Mean	0,050		0,848		0,645	
Reproducibility s.d.	0,007		0,129		0,113	
Rel. reproducibility s.d.	15,08 %		15,19 %		17,54 %	
Reference value	0,048		0,942		0,710	
Target s.d.	0,005		0,085		0,064	
Rel. target s.d.	10,00 %		10,00 %		10,00 %	
Lower limit of tolerance	0,040		0,679		0,516	
Upper limit of tolerance	0,060		1,018		0,774	
Type B outliers	0		0		0	
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)	10		10		10	
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

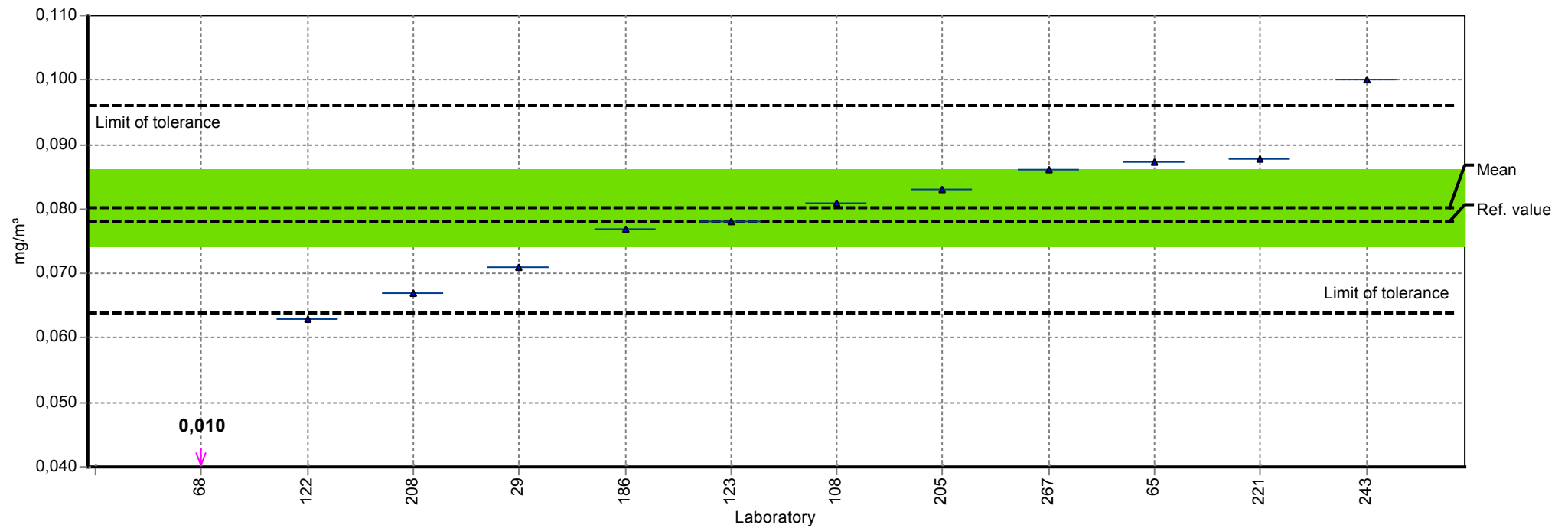
sample 3

Laboratory	FORMALD	Z score	ACETALD	Z score	PROPALD	Z score	BUTYRALD	Z score
Measurement unit	mg/m ³		mg/m ³		mg/m ³		mg/m ³	
–	–	–	–	–	–	–	–	–
29	0,100	-1,846	0,601	-0,700	0,835	-0,499		
65	0,132	0,768	0,702	0,866	0,929	0,568	0,847	-0,239
68	0,020	-8,369	0,180	-7,215	0,180	-7,952	0,490	-4,356
108	0,126	0,274	0,655	0,135	0,951	0,821	0,905	0,424
122	0,114	-0,705	0,354	-4,522	0,463	-4,732	0,509	-4,137
123	0,115	-0,623	0,623	-0,360	0,904	0,286	0,854	-0,164
186	0,106	-1,357	0,567	-1,226	0,816	-0,715	0,777	-1,051
205	0,130	0,600	0,630	-0,251	0,930	0,582	0,870	0,020
208	0,107	-1,275	0,639	-0,112	0,858	-0,238	0,796	-0,832
221	0,137	1,171	0,635	-0,169	0,724	-1,761	0,871	0,027
243	0,150	2,231	0,710	0,986	1,190	3,540	0,960	1,057
267	0,132	0,763	0,700	0,832	0,963	0,957	0,934	0,758
281	< 0,297							
–	–	–	–	–	–	–	–	–
Method	ISO 5725		ISO 5725		ISO 5725		ISO 5725	
Assessment	Z ≤2,000		Z ≤2,000		Z ≤2,000		Z ≤2,000	
Mean	0,123		0,646		0,879		0,868	
Reproducibility s.d.	0,015		0,047		0,078		0,059	
Rel. reproducibility s.d.	12,54 %		7,20 %		8,84 %		6,85 %	
Reference value	0,119		0,783		0,902		0,880	
Target s.d.	0,012		0,065		0,088		0,087	
Rel. target s.d.	10,00 %		10,00 %		10,00 %		10,00 %	
Lower limit of tolerance	0,098		0,517		0,703		0,695	
Upper limit of tolerance	0,147		0,776		1,055		1,042	

Laboratory	FORMALD	Z score	ACETALD	Z score	PROPALD	Z score	BUTYRALD	Z score
Type B outliers	1		1		1		0	
Type F outliers	0		1		2		2	
No. of laboratories after elimination of outliers type A-D and F (w ithout laboratories that only gave states but no measured values)	11		10		9		9	
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								

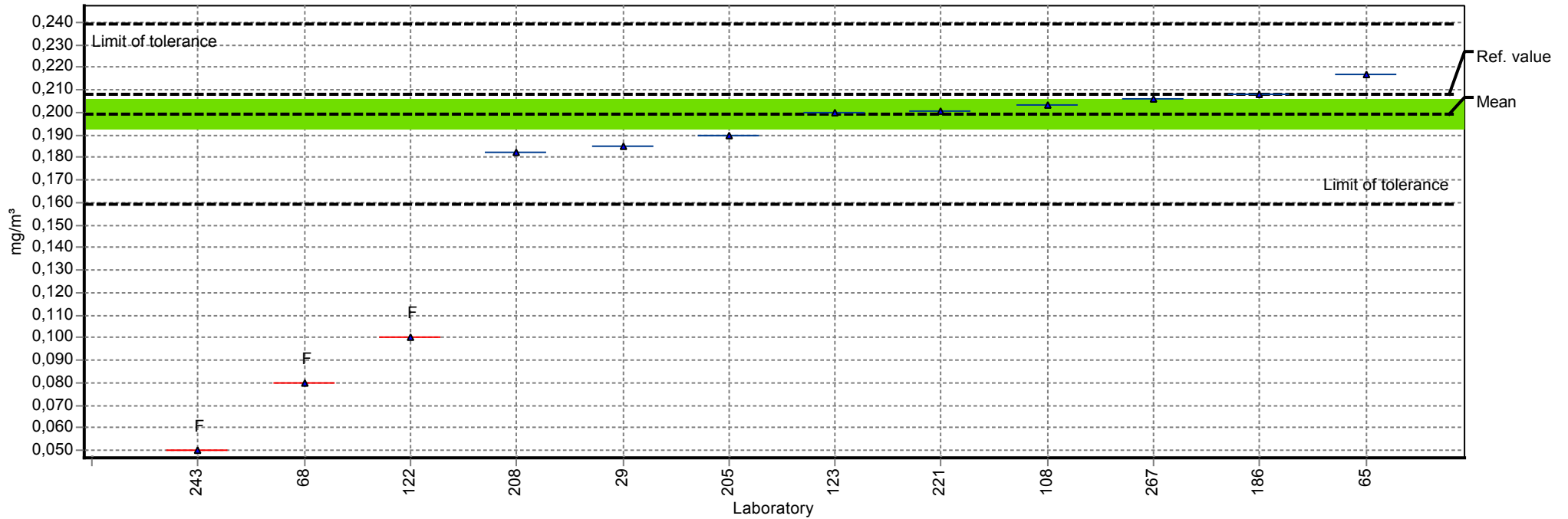
Summary results

Measurand:	Formaldehyde	Mean:	0,080 mg/m ³
Sample:	sample 1	Reproducibility s.d.:	0,011 mg/m ³
Method:	ISO 5725	Rel. reproducibility s.d.:	13,16%
No. of laboratories:	11	Tolerance limits:	0,064 - 0,096 mg/m ³ (Z score < 2,00)



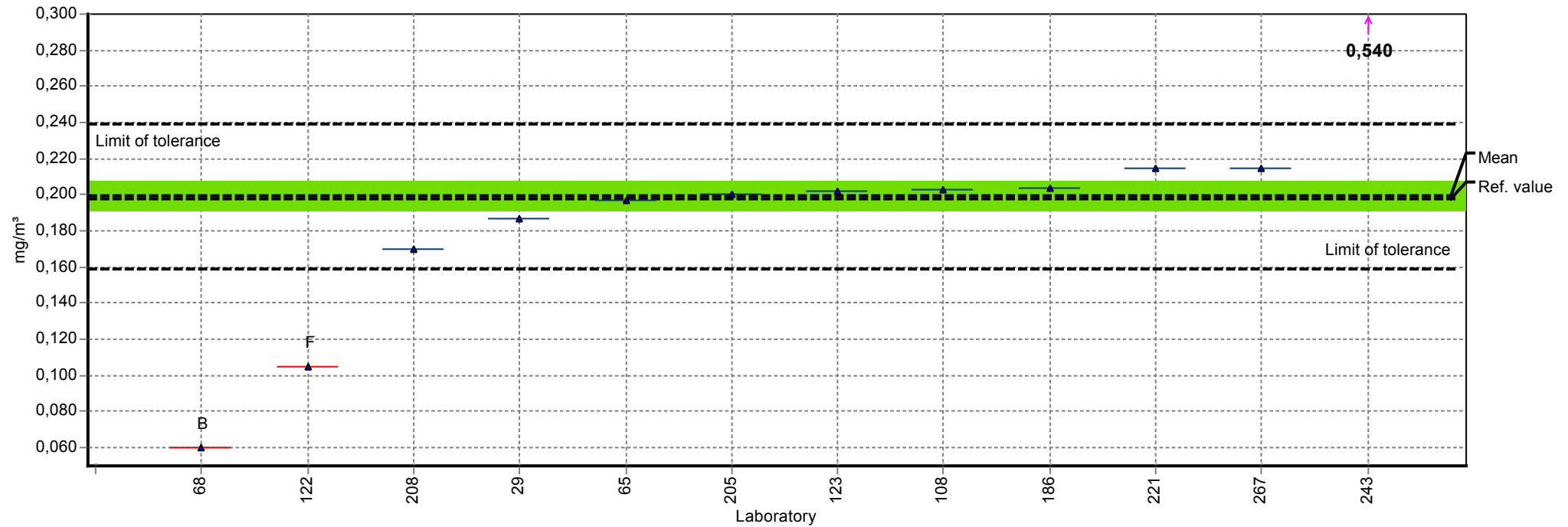
Summary results

Measurand:	Acetaldehyde	Mean:	0,199 mg/m ³
Sample:	sample 1	Reproducibility s.d.:	0,011 mg/m ³
Method:	ISO 5725	Rel. reproducibility s.d.:	5,69%
No. of laboratories:	9	Tolerance limits:	0,159 - 0,239 mg/m ³ (Z score < 2,00)



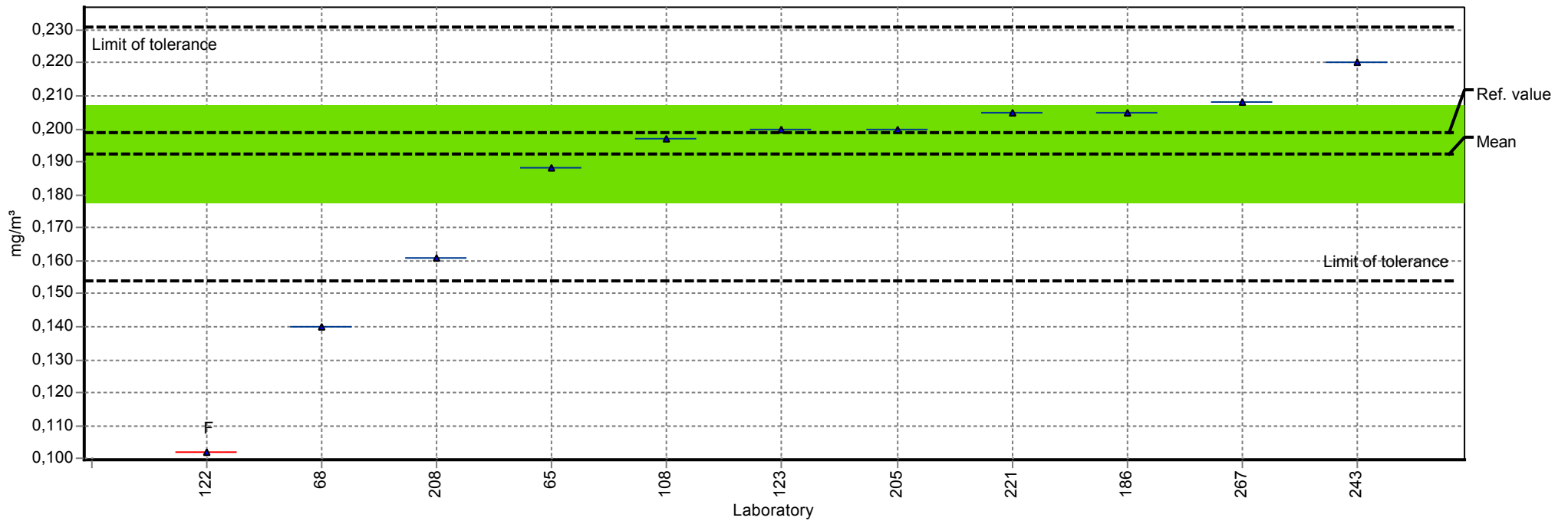
Summary results

Measurand:	Propionaldehyde	Mean:	0,199 mg/m ³
Sample:	sample 1	Reproducibility s.d.:	0,014 mg/m ³
Method:	ISO 5725	Rel. reproducibility s.d.:	6,96%
No. of laboratories:	9	Tolerance limits:	0,159 - 0,239 mg/m ³ (Z score < 2,00)



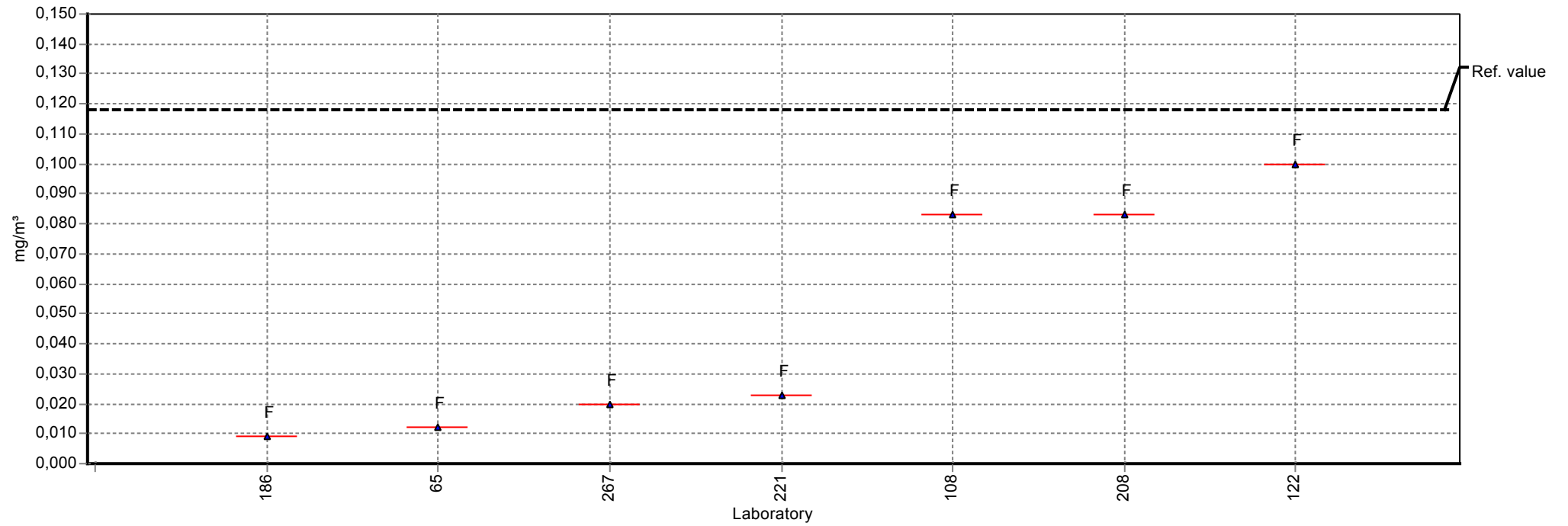
Summary results

Measurand:	Butyraldehyde	Mean:	0,192 mg/m ³
Sample:	sample 1	Reproducibility s.d.:	0,024 mg/m ³
Method:	ISO 5725	Rel. reproducibility s.d.:	12,50%
No. of laboratories:	10	Tolerance limits:	0,154 - 0,231 mg/m ³ (Z score < 2,00)



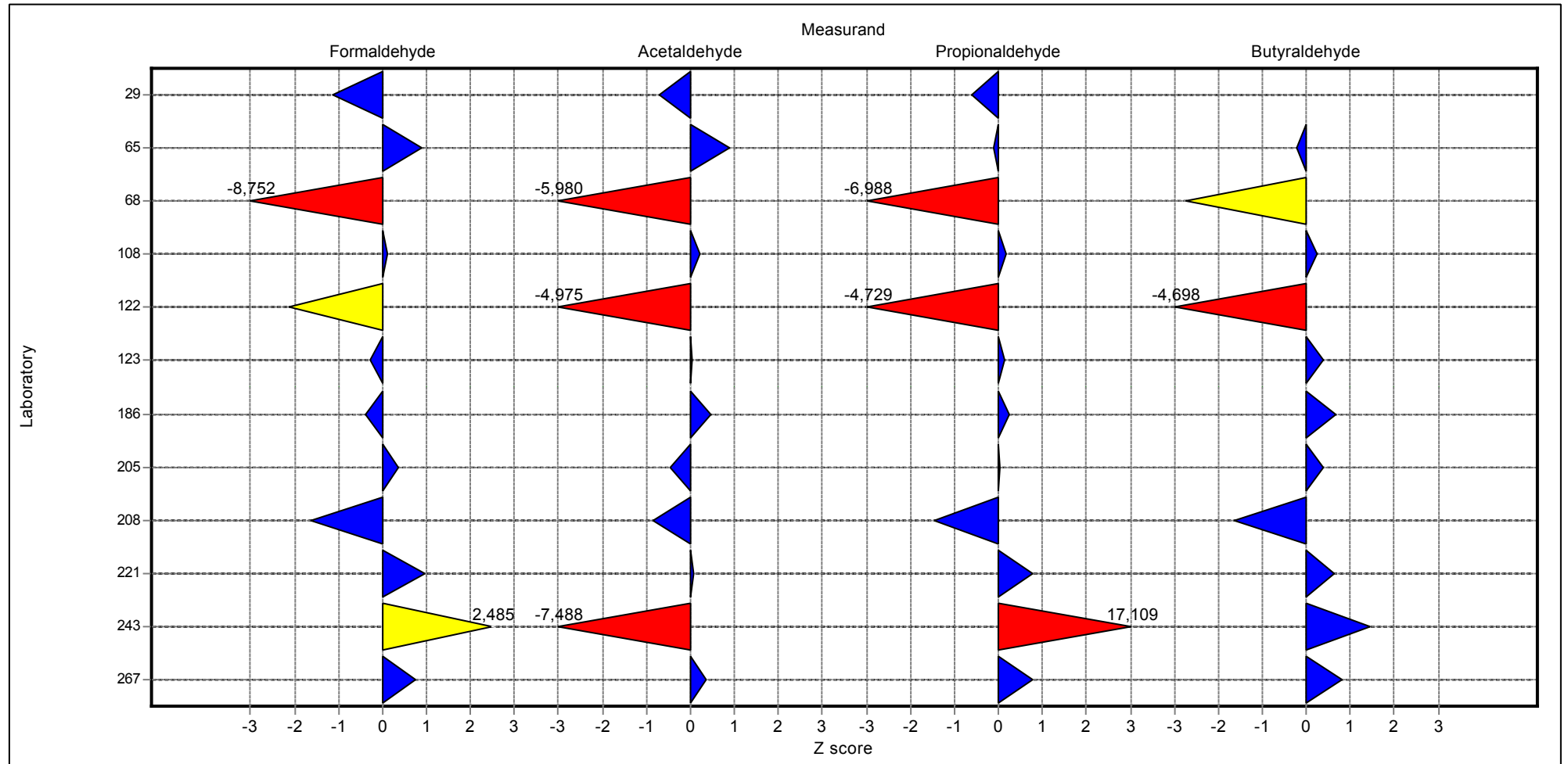
Summary results

Measurand: Acrolein Reference value: 0,118 mg/m³
Sample: sample 1
Method: ISO 5725
No. of laboratories: 0



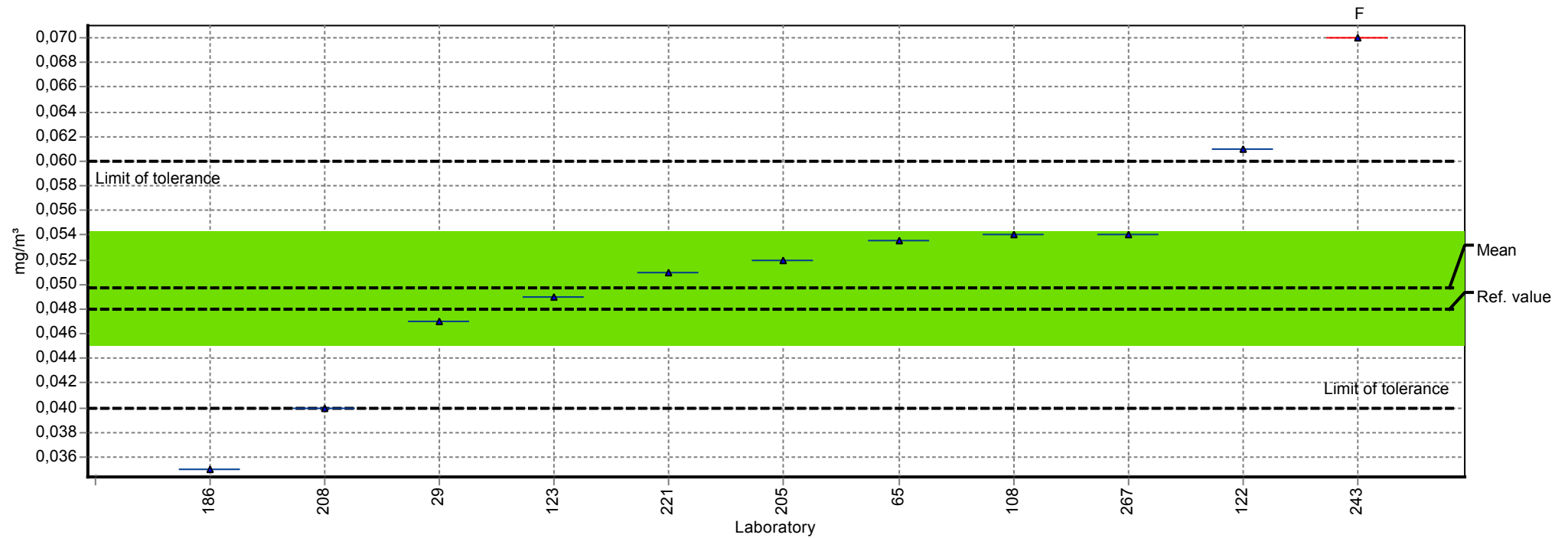
Sample chart of Z scores

Sample: sample 1



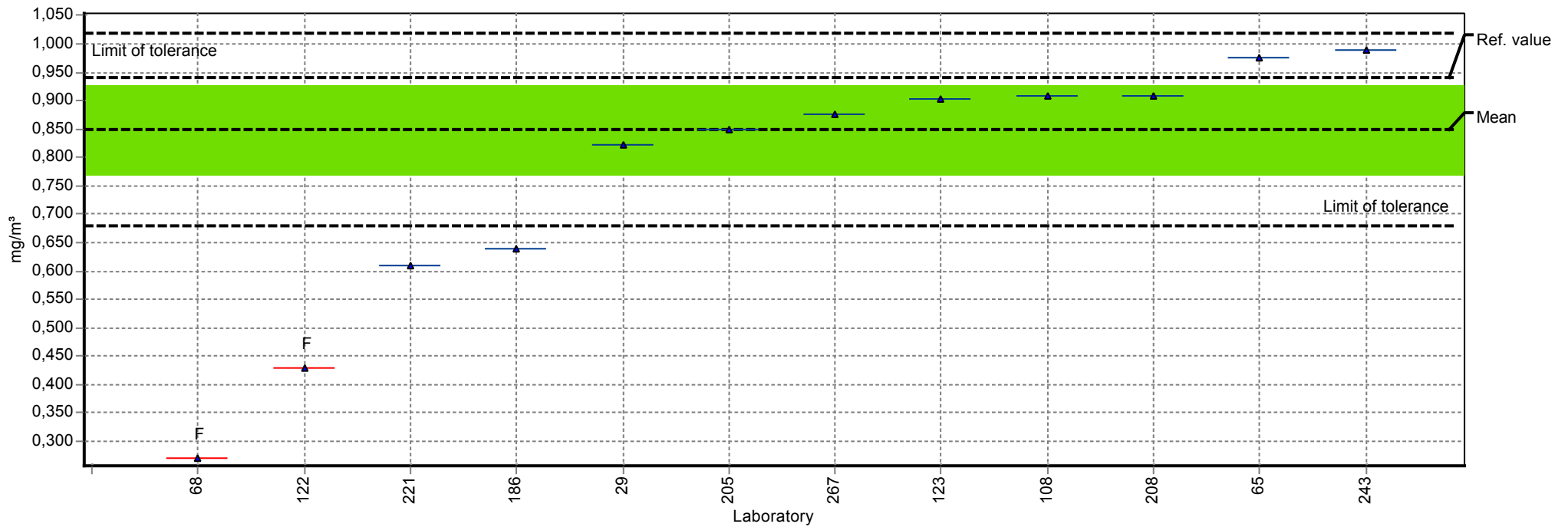
Summary results

Measurand:	Formaldehyde	Mean:	0,050 mg/m ³
Sample:	sample 2	Reproducibility s.d.:	0,007 mg/m ³
Method:	ISO 5725	Rel. reproducibility s.d.:	15,08%
No. of laboratories:	10	Tolerance limits:	0,040 - 0,060 mg/m ³ (Z score < 2,00)



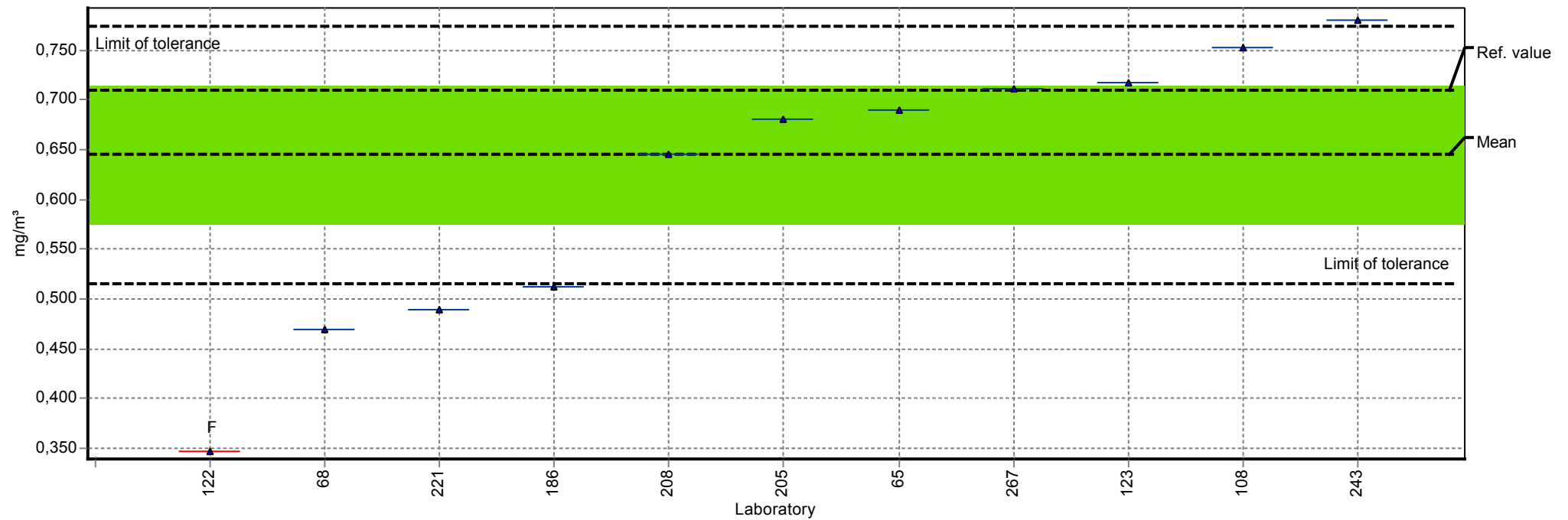
Summary results

Measurand:	Acetaldehyde	Mean:	0,848 mg/m ³
Sample:	sample 2	Reproducibility s.d.:	0,129 mg/m ³
Method:	ISO 5725	Rel. reproducibility s.d.:	15,19%
No. of laboratories:	10	Tolerance limits:	0,679 - 1,018 mg/m ³ (Z score < 2,00)



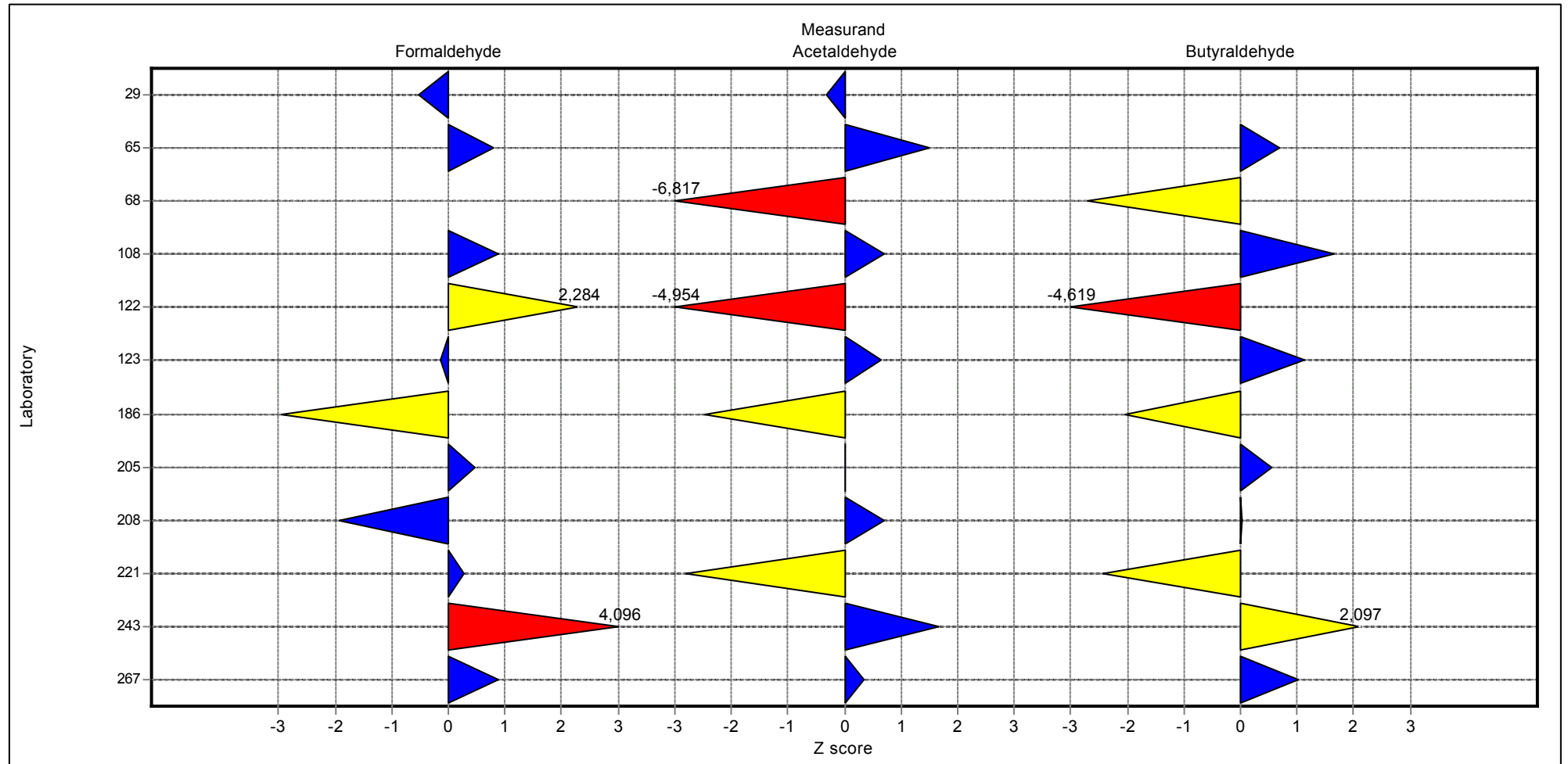
Summary results

Measurand:	Butyraldehyde	Mean:	0,645 mg/m ³
Sample:	sample 2	Reproducibility s.d.:	0,113 mg/m ³
Method:	ISO 5725	Rel. reproducibility s.d.:	17,54%
No. of laboratories:	10	Tolerance limits:	0,516 - 0,774 mg/m ³ (Z score < 2,00)



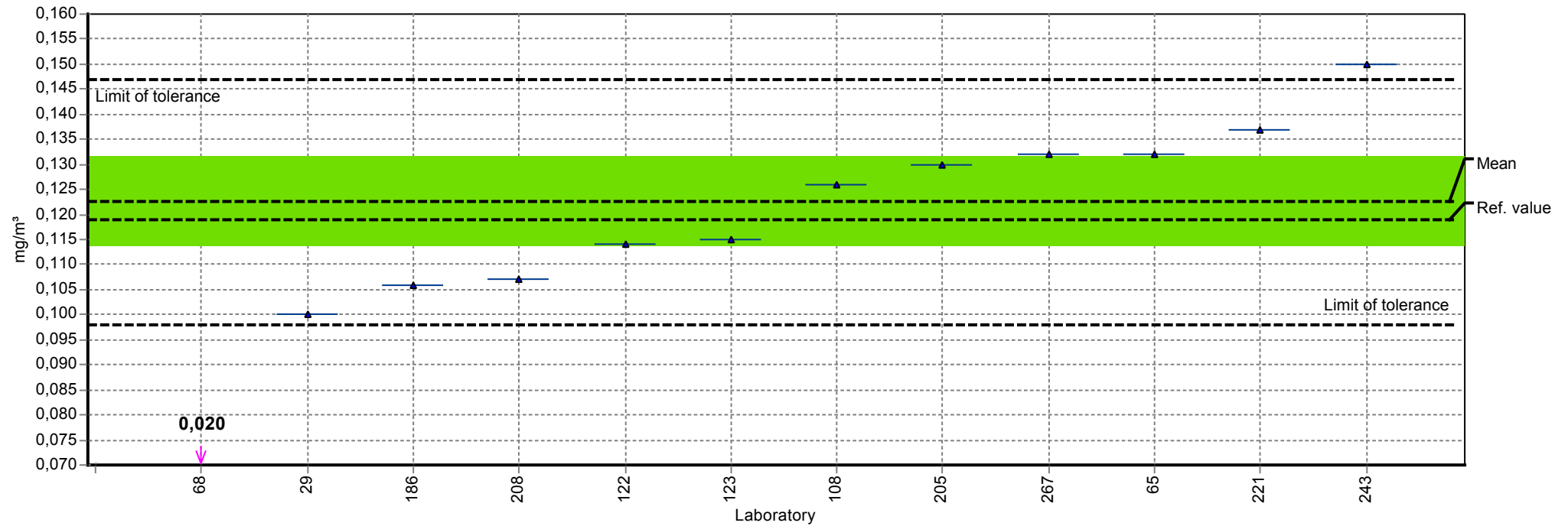
Sample chart of Z scores

Sample: sample 2



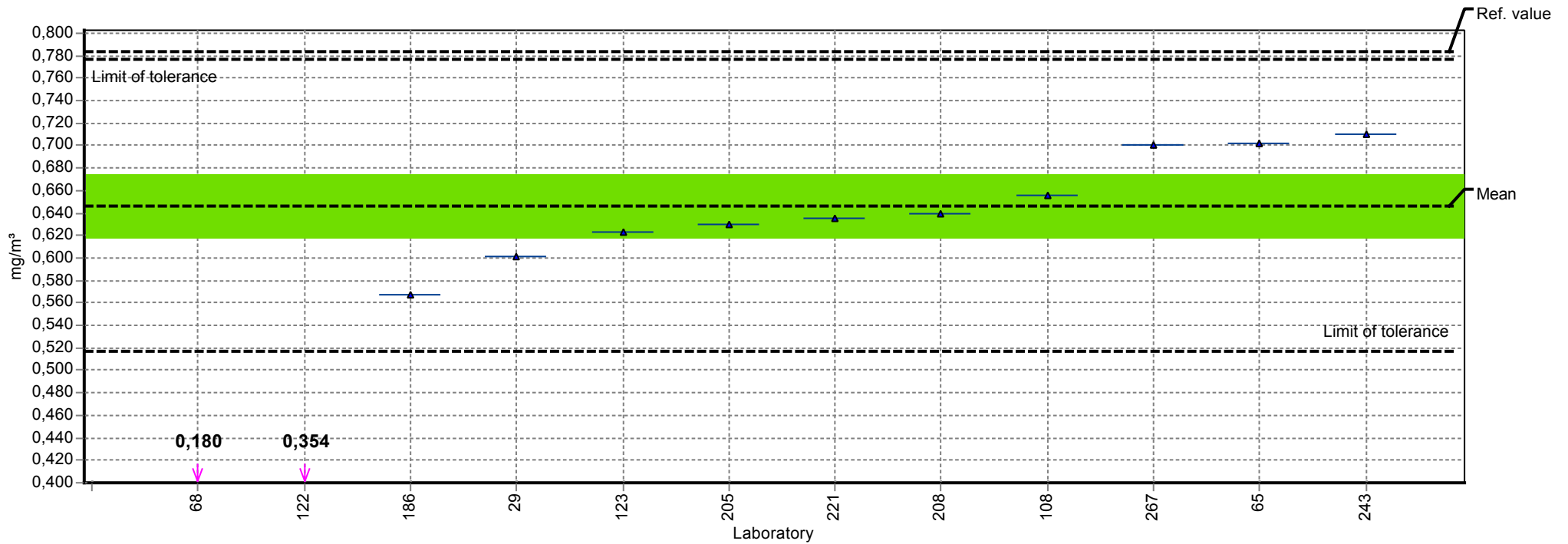
Summary results

Measurand:	Formaldehyde	Mean:	0,123 mg/m ³
Sample:	sample 3	Reproducibility s.d.:	0,015 mg/m ³
Method:	ISO 5725	Rel. reproducibility s.d.:	12,54%
No. of laboratories:	11	Tolerance limits:	0,098 - 0,147 mg/m ³ (Z score < 2,00)



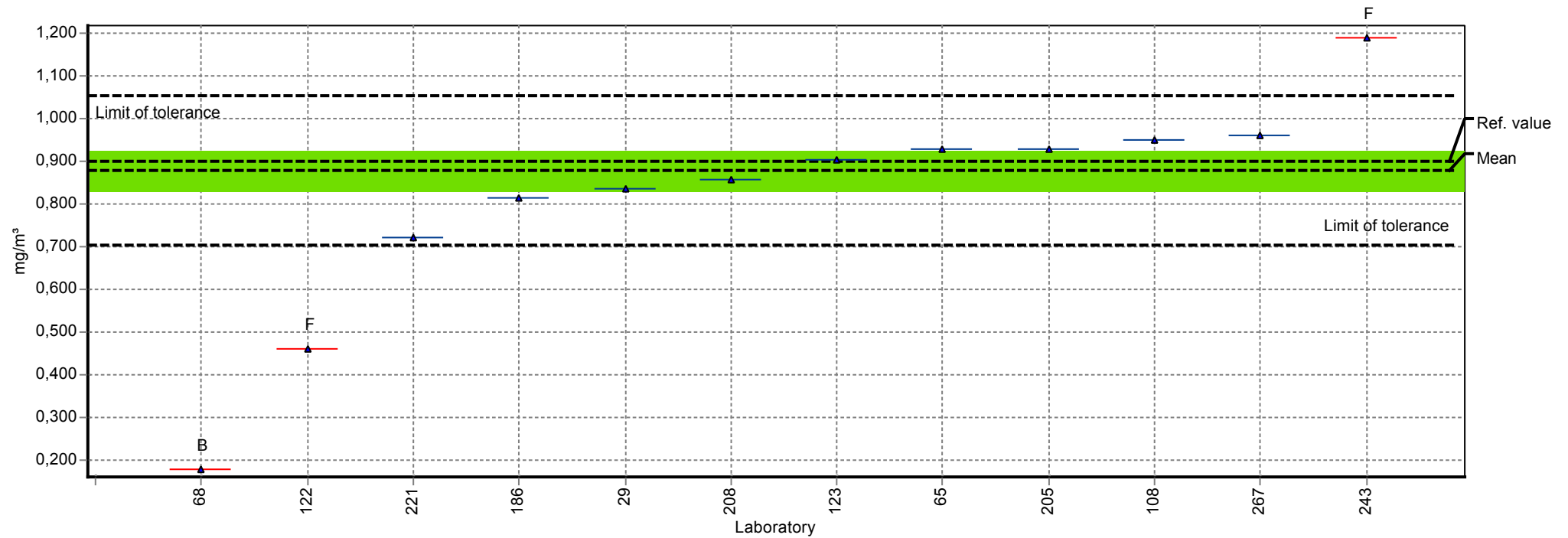
Summary results

Measurand:	Acetaldehyde	Mean:	0,646 mg/m ³
Sample:	sample 3	Reproducibility s.d.:	0,047 mg/m ³
Method:	ISO 5725	Rel. reproducibility s.d.:	7,20%
No. of laboratories:	10	Tolerance limits:	0,517 - 0,776 mg/m ³ (Z score < 2,00)



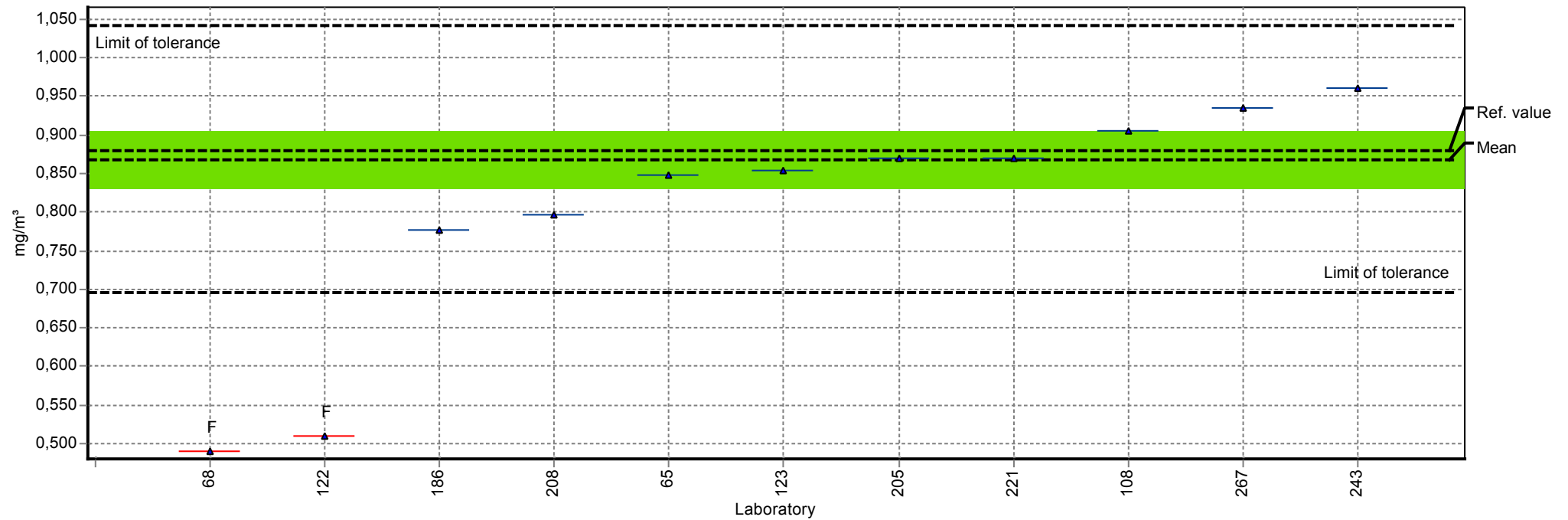
Summary results

Measurand:	Propionaldehyde	Mean:	0,879 mg/m ³
Sample:	sample 3	Reproducibility s.d.:	0,078 mg/m ³
Method:	ISO 5725	Rel. reproducibility s.d.:	8,84%
No. of laboratories:	9	Tolerance limits:	0,703 - 1,055 mg/m ³ (Z score < 2,00)



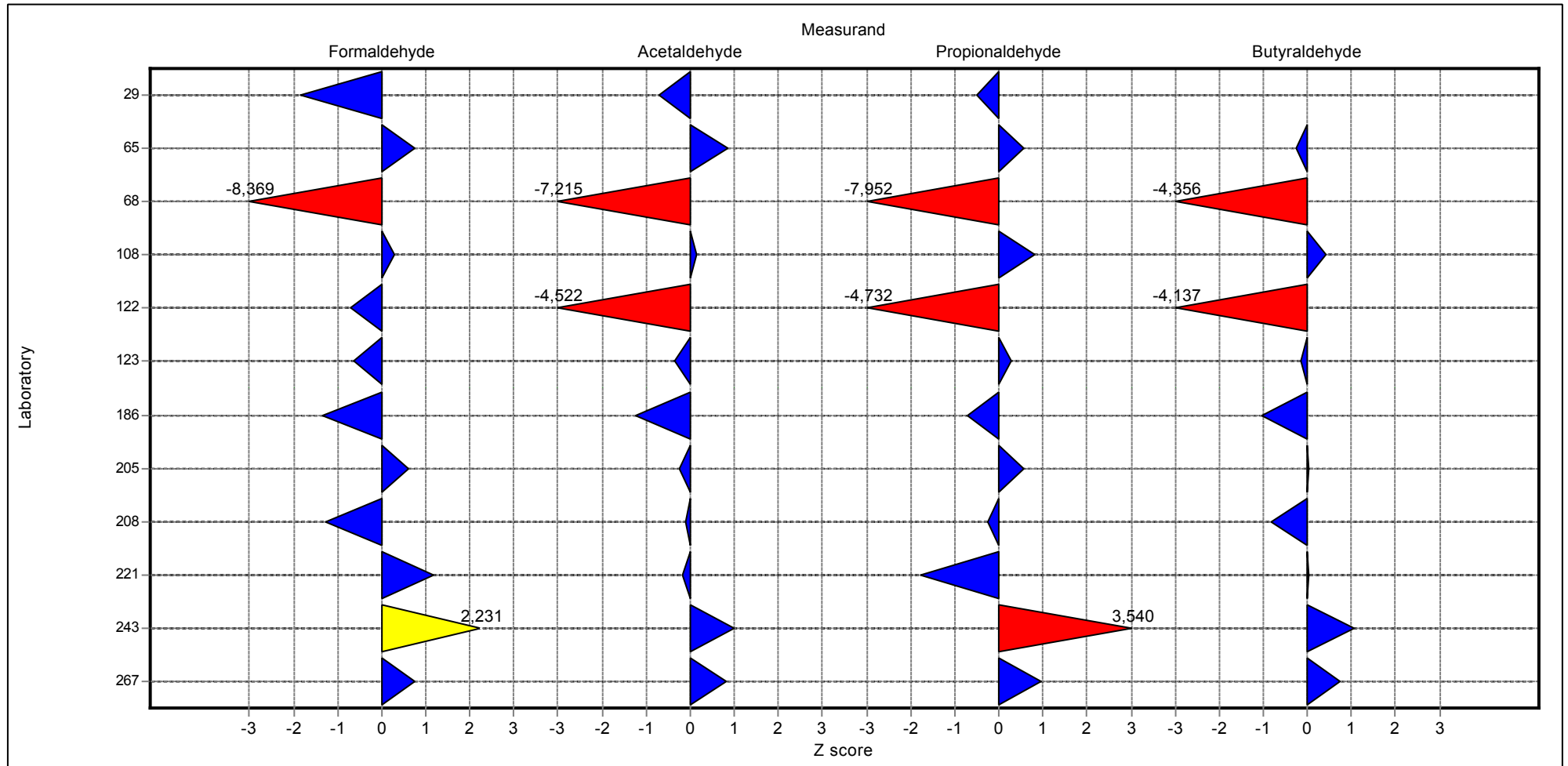
Summary results

Measurand:	Butyraldehyde	Mean:	0,868 mg/m ³
Sample:	sample 3	Reproducibility s.d.:	0,059 mg/m ³
Method:	ISO 5725	Rel. reproducibility s.d.:	6,85%
No. of laboratories:	9	Tolerance limits:	0,695 - 1,042 mg/m ³ (Z score < 2,00)



Sample chart of Z scores

Sample: sample 3



Questions and Answers

Participant	kind of tube	solvent	method
29	Waters XPOsure DNPH Kartuschen	Acetonitril	HPLC
65	DNPH-Kieselgel-Kartusche	Acetonitril	HPLC
68	mit Dinitrophenylhydrazin imprägnierte Glasfaserfilter	Acetonitril	BIA-Arbeitsmappe
108	SUPELCO LPDNPH S10, 21026-UA	Acetonitril Fa. Baker	DIN ISO 16000-3
122	SKC DNPH-Silicagel-Röhrchen 226-119 LOT7043 Exp. Feb/2013	Acetonitril	DFG Methode 2: Aldehyde
123	w aters Sep-Pak XpoSure Aldehyde Sampler	acetonitrile	ISO/DIS 16000-3 LC/UV
186	WATERS DNPH CARTRIDGES WATERS	Acetonitril	ISO 16000-3
205	Waters Sep-Pak DNPH-Kartuschen	Acetonitril	DIN ISO 16000-3
208	Sep-Pak DNPH-silica cartridge	acetonitrile	EPA-TO-11A
221	Lp DNPH S10	Acetonitril	ISO 16000-3
243	Silicagel Röhrchen, DNPH belegt, Fa. SKC	Acetonitril	HPLC
267	LpDNPH Sigma 21014	Acetonitril	HPLC
281	SKC 226-119	Acetonitrile	NIOSH 2016

Participant	volume	time of desorption
29	5 ml	5 min
65	5 ml	
68	10ml	3 Stunden, nach Filtration 48 Stunden im Kühlschrank
108	5 ml	Durchtropfen ohne Einwirkzeit
122	5 ml	5 min
123	5 mL	10 min
186	5mL	4min
205	3 ml	
208	3 ml	1 min
221	5 ml	10 min
243	je 5 ml auf Mess-und Kontrollzone	1 h im Ultraschallbad, danach mindestens 12 h Desorptionszeit (bei RT) vor der Analyse

Ringversuch Aldehydes 3

Participant	volume	time of desorption
267	5ml	3min
281	10 mL	15 min

Participant	injection volume	pump/pressure
29	10µl	Niederdruck
65	1 µl und 10 µl	140
68	2ul	120 bar
108	10µl / 2 µl	HPLC Druck, 240 bar
122	10 µl und variabel	Niederdruckgradient / variabel
123	25 µL	132 Bars
186	20µL	2300 psi
205	10 µl	Agilent 1100 System
208	5 µl	2200 psi
221	20 µl	1050 Agilent, 60 bar
243	5 µl	HP / 1090
267	25µl	quaternär, 200bar
281	20 uL	

Participant	mobile phase
29	Acetonitril/Wasser/THF
65	Methanol/Wasser
68	Acetonitril, Methanol, Wasser
108	Methanol / Wasser, Gradient A MeOH/H2O 50/50, B MeOH
122	Wasser / Acetonitril
123	acetonitrile/H2O
186	Acetonitril / Water / THF
205	Wasser / Acetonitril
208	A - ACN/THF/w ater (30:10:60), B - ACN/w ater (80:20)
221	ACN/Wasser
243	A: Milli-Q-Wasser / Acetonitril / Tetrahydrofuran 60/30/10 (v/v/v) B: Acetonitril / Milli-Q-Wasser 60 / 40 (v/v)
267	Acetonitril/Wasser
281	45% ACN / 55% H2O

Ringversuch Aldehydes 3

Participant	gradient/temperature program
29	ja
65	60/40
68	Gradient
108	21°C / 0 min, 12 min 100%, 16 min 100% B, 17 min 0 %B, 17 min 0% B; 5,5 min Postime
122	variabel / 45°C
123	1- 60%H2O/40%CH3CN 20 min - 2- 60%H2O/40% CH3CN à 20%H2O/80%CH3CN 20-48 min - 3 - 20%H2O/80%CH3CN 48-53 min - 4- 60%H2O/40%CH3CN 53.1-60 min / 25°C
186	35°C
205	
208	gradient/T = 30 °C
221	0 min 60 % ACN, 15 min 100 % ACN
243	Gradient
267	40/60 H2O-Acetonitril 7min, 100% Acetonitril 20min.
281	32 C

Participant	flow rate	analytical column/dimension	detector
29	1,5ml/min	Waters XBridge Phenyl 3,5µm 150 x 4,6mm	DAD
65	1 ml/min	C18	DAD
68	1ml/min	Poroshell 120 EC 18	UV Detektor
108	0,55 ml/min	Lichrospher 100 RP-18, 5µm - 250mm*3mm mit Vorsäule	UV-DAD
122	0,7 ml/min	RP-18 (5µm) / 125-4 x 2	DAD
123	1 mL/min	Precolumn Vydac C18 201TP C18 5 µm - colum Supelco Discovery	Diodes array detecto : DAD
186	1.5 mL/min	WATERS NOVAPACK C18 / 150mm X 3.9mm X 4µm	PAD
205	0,7 ml/min	Waters Nova Pak C18; 150 mm x 3,9 mm x 4 µm	DAD
208	0.2 ml/min	SunFire C18 3.5 µm/2.1 x 150 mm	Waters M996 PDA detector
221	0,7 ml/min	Nucleosil 100-10 C 18, 250x4 (MN)	DAD 1100 Agilent
243	0,4 ml/min	Kromasil 100 C18; 5 µm, 250 x 2,1 mm	HP 1090 DAD
267	1.5ml/min	Symmetry C18, 250mm x 4.5mm x 5µm (Waters)	DAD
281	1.3 mL/min	Vydac C18 5um, 250 x 4.6 mm	DAD

Participant	wavelength	date of analysis
29	365 nm	19.10.11
65	360 nm	26.-29.09.2011

Ringversuch Aldehydes 3

Participant	wavelength	date of analysis
68	365 nm	2.11.2011
108	350 nm BW20 -Ret 550 nm BW 80nm	23.09.2011
122	365 nm	September - November 2011
123	365,4 nm	06/10/11
186	360nm	23/09/11
205	365 nm	25.10. - 2.11.2011
208	360 nm	27.9.2011
221	365 nm	26.09.2011
243	Sign. 360 nm, 10 nm Ref. 500 nm, 80 nm	29.09.2011 bis 09.11.2011
267	365	26.9.2011
281	360 nm	11/10/2011