



THE GLOBAL STANDARD
FOR LIVESTOCK DATA

Network. Guidelines. Certification.

ICAR PROFICIENCY TEST - SEPTEMBER 2023

Raw cow milk
“Reference” Methods





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FRAME OF ACTIVITY :

ICAR MILK ANALYSES SUB-COMMITTEE (MA SC)

ORGANISER: ICAR, ARTHUR VAN SCHENDELSTRAAT 650, 3511 MJ UTRECHT, THE NETHERLANDS

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1. Introduction

Dear Participant,

Thank you for participating in the ICAR Proficiency Test (PT) September 2023 !

This is the sixteenth round that ICAR organized since 2016 !!!

The sample preparation and statistical elaboration have been done by ICAR with Sub- contractor Actalia, accredited for ISO 17043.

The synthetic report and control charts over the time are prepared by ICAR.

The advantage to participate in the PT round is to obtain a worldwide updated picture of the analytical situation for milk analyses.

For somatic cell parameter, since March 2020 we have the possibility to build the international traceability to the EC JRC Certified reference material for somatic cell counting in milk. Following the ISO/IDF Bulletin 508/2021 Guidance and application of EC JRC Certified reference material for somatic cell counting in milk we have characterized the ICAR PT samples. These values and the ISO 13366-2 standard deviation of reproducibility, will be used to calculate, for **SCC ZScore FIX**. In this way the ZS FIX will be better anchored to the international metrological traceability and you can follow your instrument performance over the time.

In this report you will find sections 2 and 3 which are dedicated to "your" quality assurance management and section 4 dedicated to the "general" statistical elaboration for each parameter.

The proficiency test is a tool to help evaluate the performance of the laboratory process and to support your laboratory quality assurance system. Its aim is to provide independent data for you to monitor, evaluate and ultimately improve your processes as you see fit.

From the analyses of the data received we have identified some aspects that if evaluated and managed may serve to improve some control steps of your quality management ISO 17025.

When the PT samples arrive to your laboratory they can be viewed as being from a 'customer' that is asking you to provide timely, precise and accurate results.

In tables A,B,C,D,E,F,G if the information is reported correctly from the participant, then the cells are filled in green, otherwise they are highlighted in red for your attention, so you can review and verify any causal reasons internally. The control charts, will help you to follow your performance over the time.

- A) In table A you find your participation codes, for each parameter, and the information if all the results from the samples received, have been sent to the PT provider.
- B) In table B is indicated if the results have been sent on time.



- C) In table C is indicated if the results have been reported in the correct unit of measurements.
- D) It is the ranking of your laboratory. The values of table 1 for each parameter are reported. In table F the ranking of your lab will be green if the mean of difference and standard deviation of difference value are in the box of figure 2 of each parameter. Limits are only indicative and so far do not constitute standard values; they indicate what is normally reachable by labs for their self evaluation. ICAR Milk Analyses Sub Committee is monitoring these limits and eventually will update the limit of the box to evaluate the accuracy.
- E) Here are reported the samples that resulted outlier for your participation code for Cochran and/or Grubbs test
- F) The evaluation of repeatability of the results should be one of the first controls before communication of the data. In table F the absolute difference between replicates is compared with the repeatability limit of the relevant "reference" method indicated. If one or more results have a result out of the limit, the cell is in red. It may be that you have deployed a chemical method that is different from the reference method indicated. If the repeatability is bigger it will be evaluated internally with the precision of the specific method used. You can find all the detailed information of your data in Table II in the section Statistical elaboration for each parameter.
- G) In table G the results of your $Z\text{-Score}_{PT}$ (standard deviation calculated on this proficiency test) and the $Z\text{-Score}_{FIX}$ (standard deviation of the standard method) are summarized.

$Z\text{-Score}_{FIX}$ is calculated considering the standard deviation of reproducibility of the standardized method

If you have obtained all the $-2 < Z\text{-Score} < +2$ the cell will be filled in green. If you have obtained one or more results in the moderate or poor performance range the cells will be filled in yellow or red respectively.

Control Charts and tables

On the control charts are reported the last 3 proficiency tests where your lab participated

In the associated table are reported all the ZS-PT and ZS Fix where your laboratory participated

For this reason from this round the ZS values are reported according the sample order from 1 to 10 and not according the sample concentration as organized in the previous PT

In the second part of the report the statistical elaboration followed the template approved by ICAR's Milk Analyses Sub Committee. You find the statistical elaboration for all the ICAR interested parameters, fat, protein, lactose, urea and somatic cell.

We think it is important to show you, as ICAR member, the reproducibility of the ICAR laboratories, even if you have not participated in this PT round.

For each parameter the **SR= standard deviation of reproducibility** has been calculated after the outlier elimination. If you have participated, and your results are in the repeatability limits, you can use this value for the calculation of your uncertainty of measurement.

ICAR would like to see, in the next years, part 4 of this report, completed with the results, reference and/or routine methods, from all the ICAR countries for the parameters indicated.

We are sure with your support and contribution it will grow to benefit all!



The list of laboratories that participated in ICAR PT September 2023 with at least one parameter is reported below

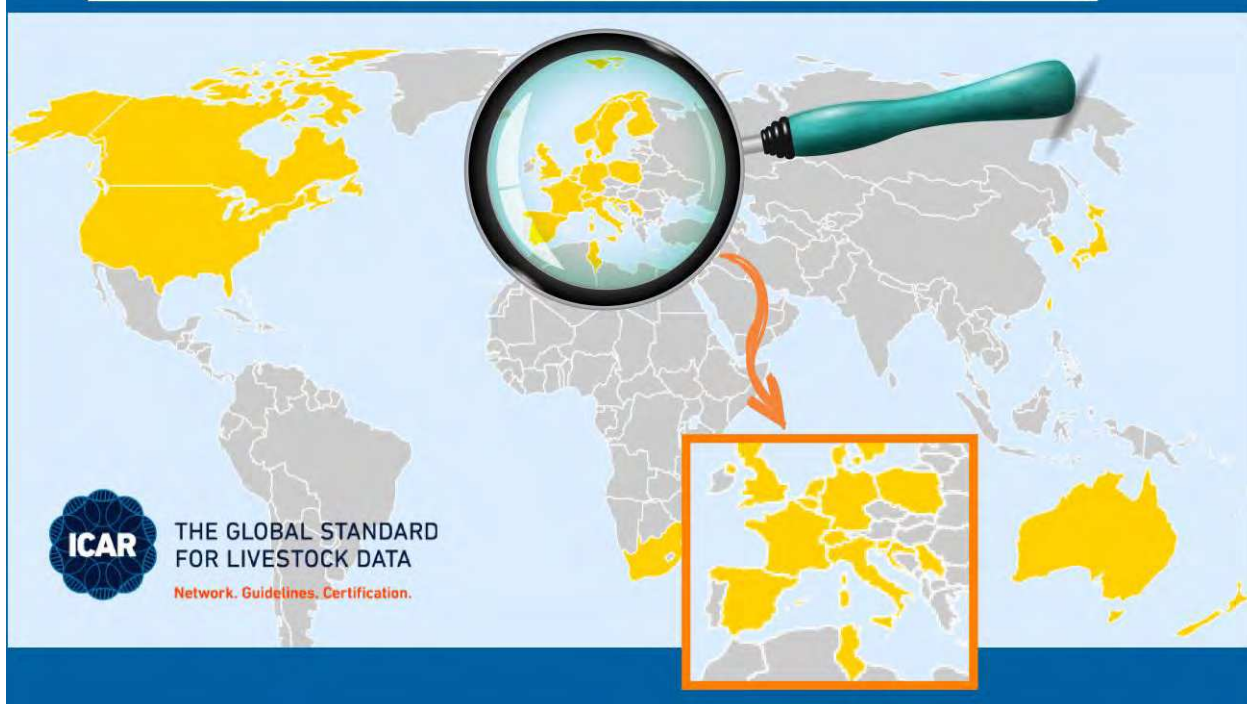
Table 1. Participating milk laboratories to the ICAR Proficiency Test (September 2023)

Country	Laboratory
Australia	Mérieux NutriSciences
Belgium	Department of Agricultural products of Walloon Agricultural Research Centre
Canada	Lactanet
Canada	Lactanet Guelph
Croatia	Hrvatska Agencija za poljoprivredu i hranu
Denmark	DeLaval International AB
Denmark	Eurofins Milk Testing Denmark
Finland	Osuuskunta Satamaito,
Finland	Valio Oy, Regional laboratory
France	ACTALIA / ACTILAIT / CECALAIT
France	Laboratoire d'Analyse du lait Beja
France	TermoFisher Scientific Lab Service Intern.
Germany	Milchkontroll und Rinderzuchtverband eG
Germany	Milchprüfing Bayern e.V.
Italy	Associazione Italiana Allevatori, Laboratorio Standard Latte (LSL-AIA)
Japan	Japan Dairy Technical Association
Netherlands	Qlip B.V.
New Zealand	MilkTestNZ
Norway	Tine Ramelklaboratoriet Heimdal
Poland	Laboratorium Oceny Mleka (KCHZ), Laboratorium Referencyjne z siedziba w Parzniewie
Poland	PFHBiPM Laboratorium w Białymstoku zs.w Jezewie Starym
Poland	PFHBiPM Laboratorium w Kobiernie
Poland	PFHBiPM Laboratorium w Parzniewie
Poland	PFHBiPM Region Oceny Bydgoszcz z/s w Minikowie
Serbia	Laboratorija za ispitivanje kvaliteta mleka, Poljoprivredni fakultet Novi Sad
Slovenia	KGZS Zavod Ptui
Slovenia	University of Ljubljana, Biotechnical Faculty, Department of Animal Science, Institute of Dairy Science and Probiotics
South Africa	ASPIRATA (Pty) Ltd t/a NOSA Testing
South Africa	Merieux NutriScience J Bay
South Africa	Mérieux NutriSciences Cape Town
South Africa	Milk Lab., Univ. of Pretoria, Fac. vet. Sc Dept. Animal Studie, Pathology. Building room N.1-32



Country	Laboratory
South Korea	Korea Animal Improvement Association
Spain	CICAP
Spain	Laboratorio Agroalimentario de Santander
Sweden	Eurofins Milk Testing Sweden AB
Switzerland	Agroscope
Switzerland	Suisselab AG
Taiwan	Council of Agriculture, Executive Yuan, Taiwan Animal Germplasm Center of TLRI
Tunisia	Office de l'Elevage et des Pasturages, Laboratoire de Controle Laitier
UK	CIS-1
UK	Dale Farm Dairy Co Operative
UK	National Milk Records plc_ Glasgow
UK	National Milk Records plc_ Wolverhampton
United States	Eastern Laboratory Services

IN YELLOW ARE INDICATE THOSE COUNTRIES WITH AT
LEAST ONE LABORATORY PARTICIPATING TO THE ICAR
PROFICIENCY TEST IN SEPTEMBER 2023





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ICAR would like to stay at your side to support you in any way we can to help improve overall quality management systems for milk analyses. Your active participation in the ICAR PTs and in the Milk Analyses meetings is encouraging. We welcome any and all feedback/comments you may have on this activity, as it will help us continuously improve and to ultimately provide you a better service.

Kind Regards,

ICAR Secretariat



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Chemical Reference Methods Laboratory participation codes and Performance analyses

**ICAR PT
RF0923**

Laboratory Name	
------------------------	--

Your participation Codes							
A	Subscription	Fat _{ref}	Protein _{ref}	Lactose _{ref}	Urea _{ref}	SCC _{ref} /alt	
			Yes	Yes	Yes	Yes	Yes
	Participation Codes	14	14	8	7	51	
	Are all the sample results received?	Yes	Yes	Yes	Yes	No	

Data results received on time						
B		Fat _{ref}	Protein _{ref}	Lactose _{ref}	Urea _{ref}	SCC _{ref} /alt
	Results reception date		15/09/2023	15/09/2023	15/09/2023	15/09/2023

Have you sent the data with the correct units of measurements?							
C		Fat _{ref}	Protein _{ref}	Lactose _{ref}	Urea _{ref}	SCC _{ref} /alt	
			g/100g	nitrogen g/100g *	g/100g	mg/dl	SCC*1000/ml
			Yes	Yes	Yes	Yes	Yes

* It was requested to report the value in total nitrogen

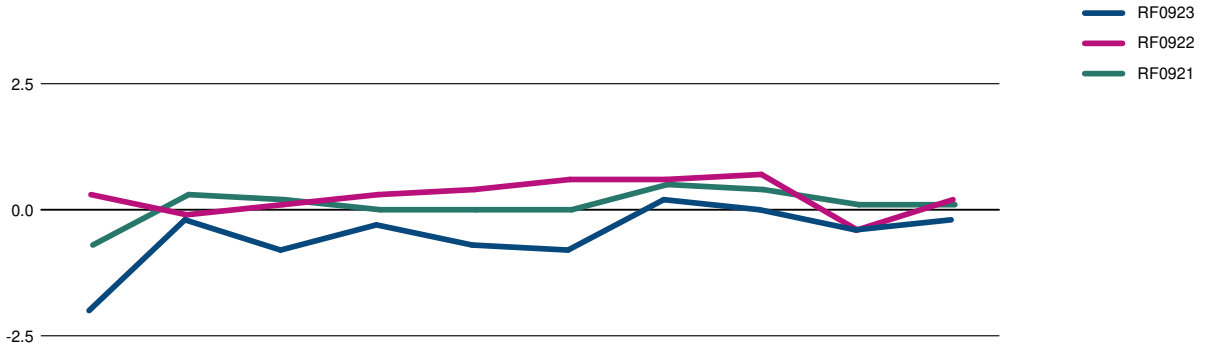
Ranking of your lab							
D		Fat _{ref}	Protein _{ref}	Lactose _{ref}	Urea _{ref}	SCC _{ref} /alt	
			g/100g	nitrogen g/100g *	g/100g	mg/dl	SCC*1000/ml
	Code	14	14	8	7	51	
	%	80	13	100	57	16	
	d	-0.010	-0.003	-0.175	-0.447	1%	
	Sd	0.014	0.007	0.043	1.244	2%	
	D	0.018	0.007	0.180	1.321	2%	
	Limits						
	d	<= 0.020	<= 0.025	<= 0.10	-2.5 <= d <= 2.5	-10% <= d <= 10%	
	Sd	<= 0.030	<= 0.020	<= 0.10	<= 1.5	<= 10%	

Outliers							
E		Fat _{ref}	Protein _{ref}	Lactose _{ref}	Urea _{ref}	SCC _{ref} /alt	
			g/100g	nitrogen g/100g *	g/100g	mg/dl	SCC*1000/ml
	Sample 1			Outliers			
	Sample 2				Outliers		
	Sample 3						
	Sample 4						
	Sample 5						
	Sample 6						
	Sample 7						
	Sample 8						
	Sample 9			Outlier			
	Sample 10			Outlier			

Repeatability						
Your "r" performance						
	Fat _{ref}	Protein _{ref}	Lactose _{ref}	Urea _{ref}	SCC _{refalt}	
	g/100g	nitrogen g/100g ·	g/100g	mg/dl	SCC*1000/ml	
Sample 1	0.030	0.001	0.17	0.65	1	
Sample 2	0.003	0.006	0.02	2.00	1	
Sample 3	0.017	0.008	0.02	0.34	4	
Sample 4	0.000	0.007	0.00	0.80	9	
Sample 5	0.014	0.007	0.01	1.58	12	
Sample 6	0.028	0.008	0.01	0.09	4	
Sample 7	0.001	0.015	0.00	0.03	8	
Sample 8	0.002	0.002	0.03	0.85	2	
Sample 9	0.003	0.000	0.09	0.85	8	
Sample 10	0.002	0.003	0.01	1.09	1	
<i>If the repeatability is smaller than the limit the cell is in green if there is a sample with a "r" bigger than the limit the cell is in red. Please check table II in correspondence of the parameter and your lab code.</i>						
Limits						
	Fat _{ref}	Protein _{ref}	Lactose _{ref}	Urea _{ref}	SCC _{refalt}	
	g/100g	nitrogen g/100g ·	g/100g	mg/dl	SCC*1000/ml	
	ISO 1211 IDF 1D	ISO 8968 IDF 20	ISO 22662 IDF 198	ISO 14637 IDF 195	ISO 13366-2 IDF 148-2	
	<= 0.043	<= 0.038	<= 0.06	<= 1.52	Level	r
					150	25
					300	42
					450	51
					750	64
					1500	126

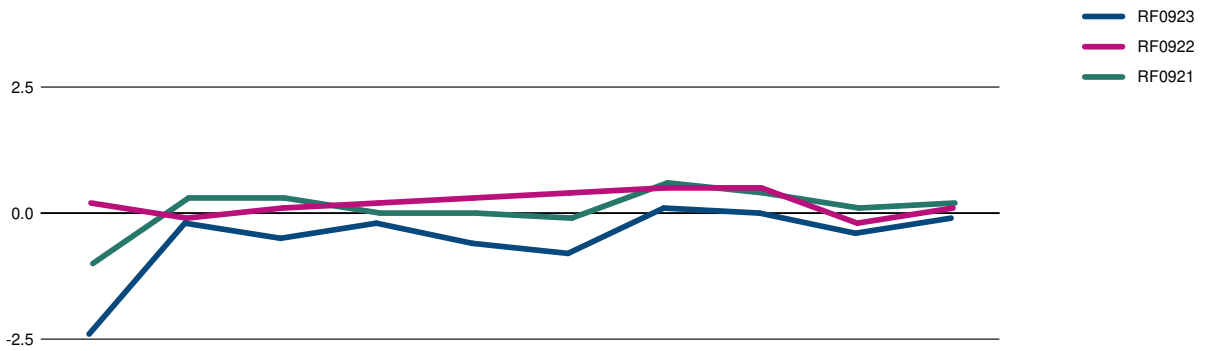
Your Z-Score PT						
	Fat _{ref}	Protein _{ref}	Lactose _{ref}	Urea _{ref}	SCC _{refalt}	
Sample 1	-2.03	-0.60	-2.16	0.16	-0.60	
Sample 2	-0.16	-0.27	-1.59	-1.23	-1.17	
Sample 3	-0.81	-0.02	-1.70	-0.67	0.49	
Sample 4	-0.29	-0.02	-2.20	-0.70	0.29	
Sample 5	-0.73	-0.13	-2.27	-1.45	-0.03	
Sample 6	-0.79	-0.34	-1.43	-1.59	-0.20	
Sample 7	0.19	-0.08	-2.34	1.13	0.50	
Sample 8	-0.03	-0.02	-1.99	-1.61	0.46	
Sample 9	-0.43	0.62	-4.83	1.78	0.29	
Sample 10	-0.23	-0.02	-5.70	-1.10	0.21	
Your Z-Score Fix						
	Fat _{ref}	Protein _{ref}	Lactose _{ref}	Urea _{ref}	SCC _{refalt}	
Sample 1	-2.39	-0.93	-4.81	0.16	-0.21	
Sample 2	-0.16	-0.30	-3.06	-0.42	-0.56	
Sample 3	-0.50	-0.03	-2.60	-0.56	0.16	
Sample 4	-0.19	-0.04	-3.79	-0.50	0.95	
Sample 5	-0.58	-0.19	-3.75	-0.42	0.24	
Sample 6	-0.83	-0.38	-1.92	-0.77	1.97	
Sample 7	0.14	-0.10	-4.20	0.91	0.52	
Sample 8	-0.02	-0.02	-4.08	-1.05	0.26	
Sample 9	-0.45	0.62	-4.26	0.92	1.15	
Sample 10	-0.12	-0.04	-4.68	-0.74	1.49	
<i>If there is a sample with a "z-score" in the yellow or red area please check table VI and VII in correspondence of your lab code.</i>						
Interpretation Z-Score						
Z-Score < -3	-3 <= Z-Score < -2	-2 <= Z-Score <= 2	2 < Z-Score <= 3	Z-Score > 3		
Poor	Moderate	Good	Moderate	Poor		

ZSCORE-PT - FAT reference



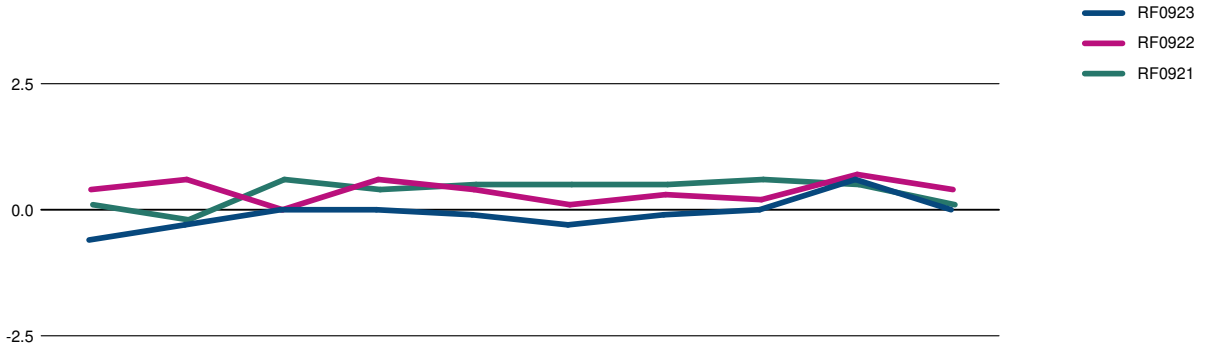
Part. code	Round	SP01	SP02	SP03	SP04	SP05	SP06	SP07	SP08	SP09	SP10	Yellow	Red	White
14	RF0923	-2.0	-0.2	-0.8	-0.3	-0.7	-0.8	0.2	0.0	-0.4	-0.2	0%	0%	100%
15	RF0922	0.3	-0.1	0.1	0.3	0.4	0.6	0.6	0.7	-0.4	0.2	0%	0%	100%
14	RF0921	-0.7	0.3	0.2	0.0	0.0	0.0	0.5	0.4	0.1	0.1	0%	0%	100%
15	RF0321	-1.4	-1.4	-1.8	-2.0	-1.1	-2.0	-1.4	-1.7	-1.6	-2.3	10%	0%	90%
11	RF0920	-0.2	-0.4	-0.1	-0.2	-0.8	-0.2	-0.8	-0.5	-0.8	-0.5	0%	0%	100%
11	RF0320	-0.3	-1.6	0.1	0.5	0.6	0.4	0.0	-1.2	-1.1	-1.4	0%	0%	100%

ZSCORE-FIX - FAT reference



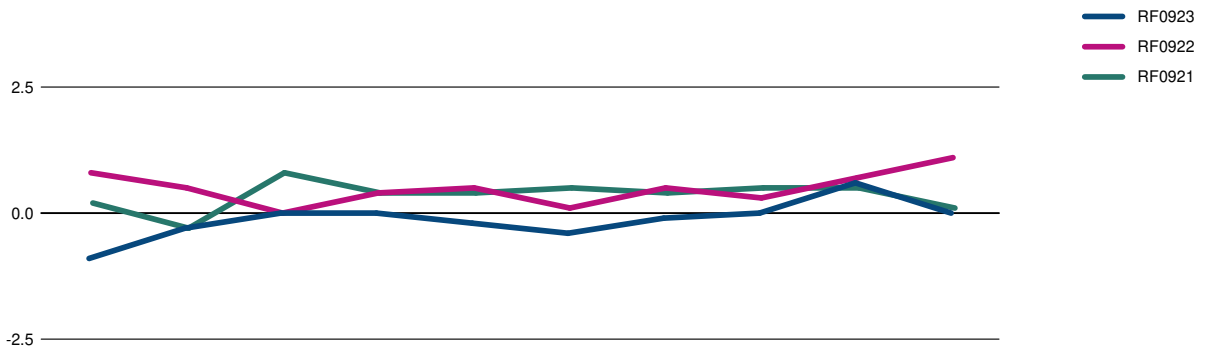
Part. code	Round	SP01	SP02	SP03	SP04	SP05	SP06	SP07	SP08	SP09	SP10	Yellow	Red	White
14	RF0923	-2.4	-0.2	-0.5	-0.2	-0.6	-0.8	0.1	0.0	-0.4	-0.1	10%	0%	90%
15	RF0922	0.2	-0.1	0.1	0.2	0.3	0.4	0.5	0.5	-0.2	0.1	0%	0%	100%
14	RF0921	-1.0	0.3	0.3	0.0	0.0	-0.1	0.6	0.4	0.1	0.2	0%	0%	100%
15	RF0321	-1.9	-1.3	-2.9	-2.2	-0.9	-2.8	-1.4	-1.3	-2.6	-2.7	50%	0%	50%
11	RF0920	-0.1	-0.1	-0.1	-0.1	-0.6	-0.2	-0.3	-0.3	-0.5	-0.6	0%	0%	100%
11	RF0320	-0.3	-1.0	0.0	0.5	0.4	0.2	0.0	-0.6	-0.4	-0.6	0%	0%	100%

ZSCORE-PT - PROTEIN reference



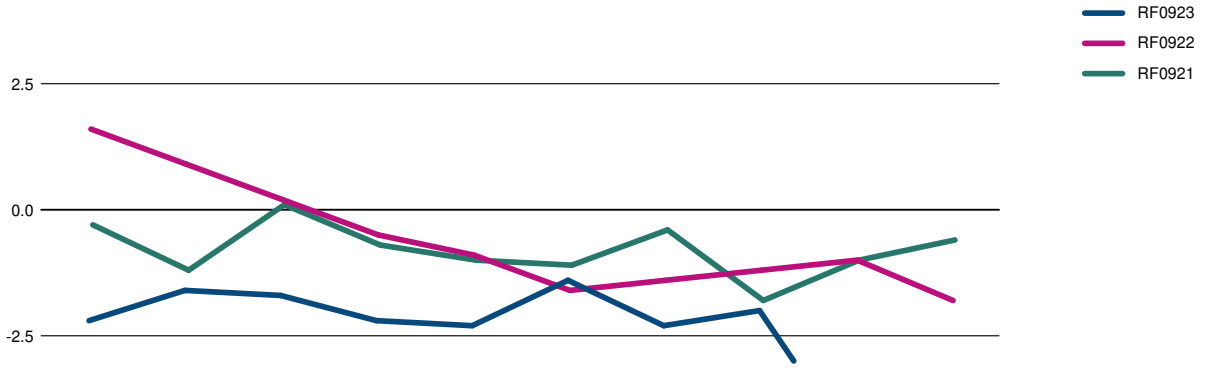
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14	RF0923	-0.6	-0.3	0.0	0.0	-0.1	-0.3	-0.1	0.0	0.6	0.0	0%	0%	100%
14	RF0922	0.4	0.6	0.0	0.6	0.4	0.1	0.3	0.2	0.7	0.4	0%	0%	100%
15	RF0921	0.1	-0.2	0.6	0.4	0.5	0.5	0.5	0.6	0.5	0.1	0%	0%	100%
15	RF0321	0.9	0.8	0.5	0.7	0.5	0.9	0.6	0.4	0.8	0.3	0%	0%	100%
11	RF0920	1.7	0.8	0.9	1.3	1.5	0.7	1.5	1.0	1.5	0.6	0%	0%	100%
11	RF0320	0.7	0.3	0.8	0.5	1.0	0.6	-0.4	0.4	1.1	-0.4	0%	0%	100%

ZSCORE-FIX - PROTEIN reference



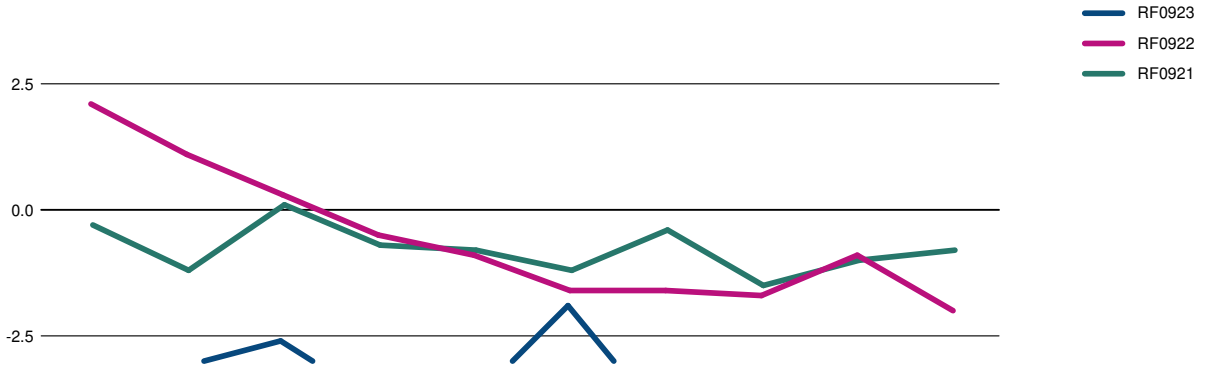
Part. code	Round	SP01	SP02	SP03	SP04	SP05	SP06	SP07	SP08	SP09	SP10	Yellow	Red	White
14	RF0923	-0.9	-0.3	0.0	0.0	-0.2	-0.4	-0.1	0.0	0.6	0.0	0%	0%	100%
14	RF0922	0.8	0.5	0.0	0.4	0.5	0.1	0.5	0.3	0.7	1.1	0%	0%	100%
15	RF0921	0.2	-0.3	0.8	0.4	0.4	0.5	0.4	0.5	0.5	0.1	0%	0%	100%
15	RF0321	0.8	0.9	0.6	0.6	0.6	1.0	0.9	0.5	0.9	0.4	0%	0%	100%
11	RF0920	1.6	0.9	0.7	0.9	1.2	0.7	1.2	1.3	1.1	0.7	0%	0%	100%
11	RF0320	0.9	0.3	0.6	0.6	0.7	0.4	-0.4	0.4	0.9	-0.3	0%	0%	100%

ZSCORE-PT - LACTOSE reference



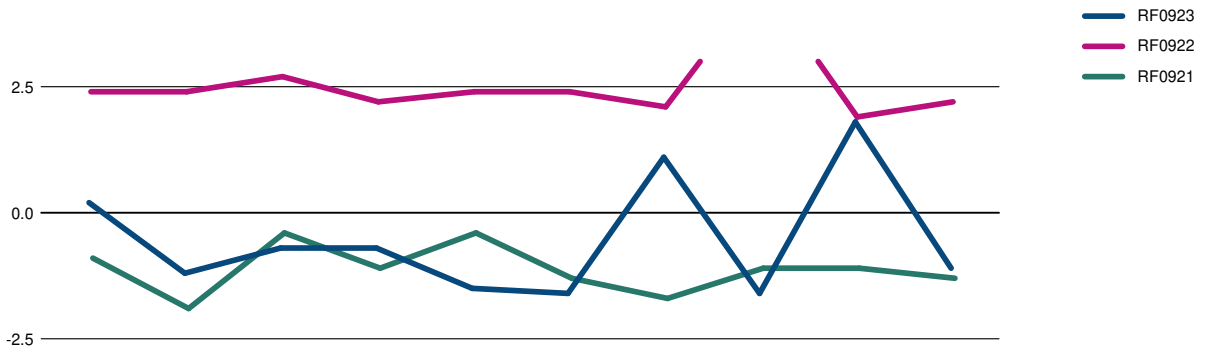
Part. code	Round	SP01	SP02	SP03	SP04	SP05	SP06	SP07	SP08	SP09	SP10	Yellow	Red	White
8	RF0923	-2.2	-1.6	-1.7	-2.2	-2.3	-1.4	-2.3	-2.0	-4.8	-5.7	40%	20%	40%
9	RF0922	1.6	0.9	0.2	-0.5	-0.9	-1.6	-1.4	-1.2	-1.0	-1.8	0%	0%	100%
9	RF0921	-0.3	-1.2	0.1	-0.7	-1.0	-1.1	-0.4	-1.8	-1.0	-0.6	0%	0%	100%
9	RF0321	-2.2	-1.1	-1.3	-2.0	-1.3	-1.5	-1.5	-1.3	-1.1	-1.7	10%	0%	90%
9	RF0320	-2.2	-2.0	-1.8	-1.8	-2.0	-1.9	-1.6	-2.0	-1.9	-2.1	20%	0%	80%

ZSCORE-FIX - LACTOSE reference



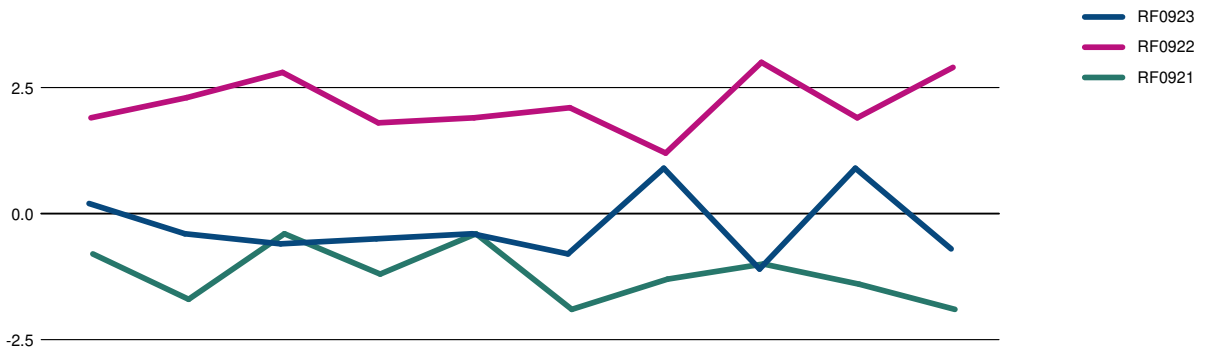
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8	RF0923	-4.8	-3.1	-2.6	-3.8	-3.8	-1.9	-4.2	-4.1	-4.3	-4.7	10%	80%	10%
9	RF0922	2.1	1.1	0.3	-0.5	-0.9	-1.6	-1.6	-1.7	-0.9	-2.0	10%	0%	90%
9	RF0921	-0.3	-1.2	0.1	-0.7	-0.8	-1.2	-0.4	-1.5	-1.0	-0.8	0%	0%	100%
9	RF0320	-5.0	-3.8	-3.2	-3.1	-3.7	-3.1	-2.5	-3.5	-3.2	-3.5	10%	90%	0%

ZSCORE-PT - UREA reference



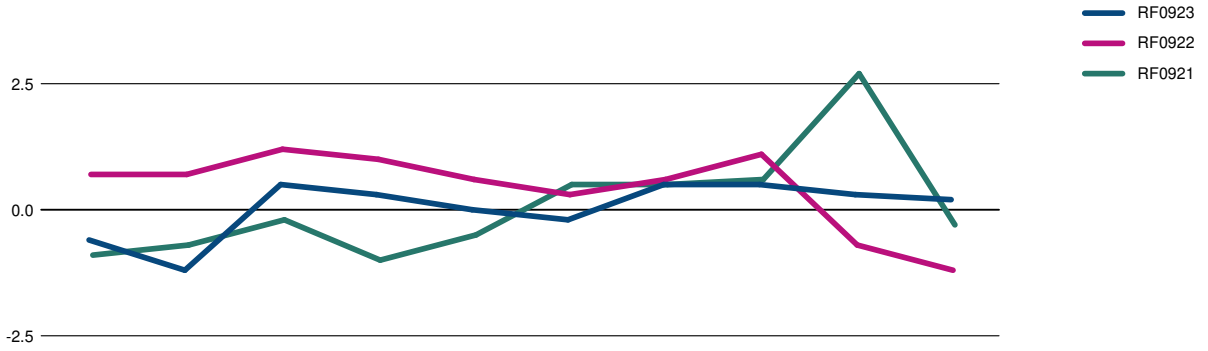
Part. code	Round	SP01	SP02	SP03	SP04	SP05	SP06	SP07	SP08	SP09	SP10	Yellow	Red	White
7	RF0923	0.2	-1.2	-0.7	-0.7	-1.5	-1.6	1.1	-1.6	1.8	-1.1	0%	0%	100%
10	RF0922	2.4	2.4	2.7	2.2	2.4	2.4	2.1	4.6	1.9	2.2	80%	10%	10%
9	RF0921	-0.9	-1.9	-0.4	-1.1	-0.4	-1.3	-1.7	-1.1	-1.1	-1.3	0%	0%	100%
7	RF0320	1.6	1.8	0.6	0.2	1.5	1.8	0.8	0.6	0.9	1.1	0%	0%	100%

ZSCORE-FIX - UREA reference



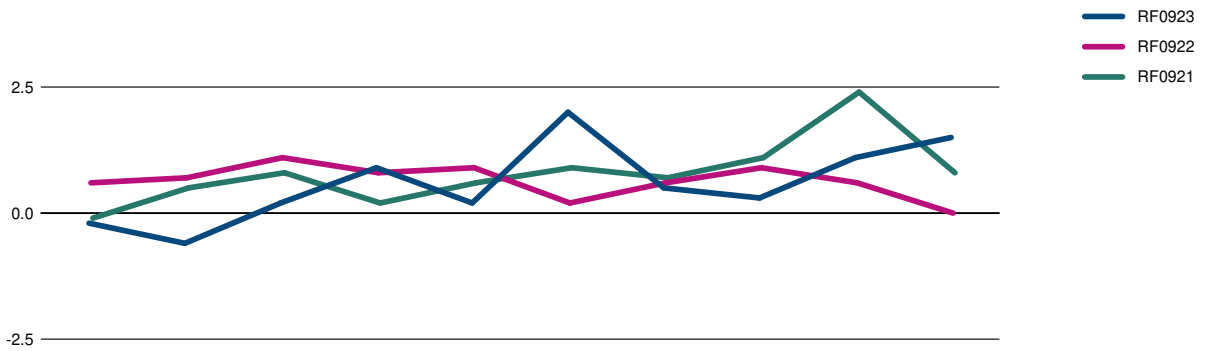
Part. code	Round	SP01	SP02	SP03	SP04	SP05	SP06	SP07	SP08	SP09	SP10	Yellow	Red	White
7	RF0923	0.2	-0.4	-0.6	-0.5	-0.4	-0.8	0.9	-1.1	0.9	-0.7	0%	0%	100%
10	RF0922	1.9	2.3	2.8	1.8	1.9	2.1	1.2	3.0	1.9	2.9	50%	0%	50%
9	RF0921	-0.8	-1.7	-0.4	-1.2	-0.4	-1.9	-1.3	-1.0	-1.4	-1.9	0%	0%	100%
7	RF0320	1.0	2.1	0.7	0.2	1.0	1.2	0.7	0.5	1.7	1.9	10%	0%	90%

ZSCORE-PT - SCC



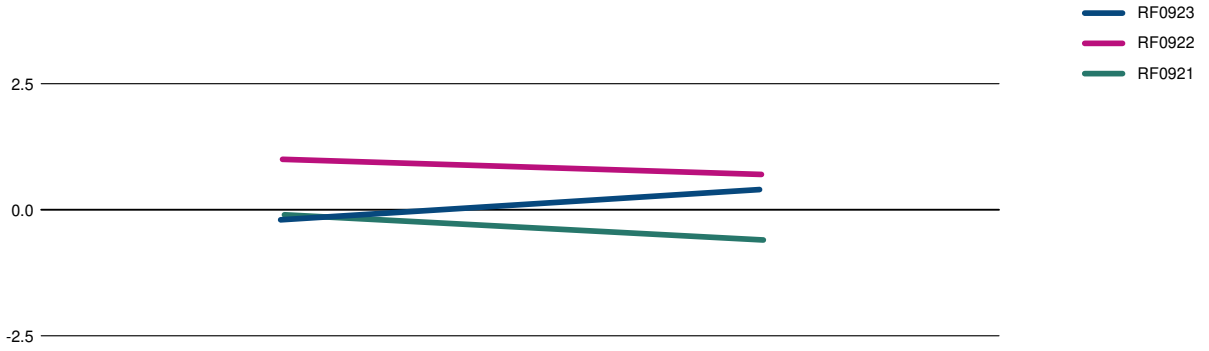
Part. code	Round	SP01	SP02	SP03	SP04	SP05	SP06	SP07	SP08	SP09	SP10	Yellow	Red	White
51	RF0923	-0.6	-1.2	0.5	0.3	0.0	-0.2	0.5	0.5	0.3	0.2	0%	0%	100%
55	RF0922	0.7	0.7	1.2	1.0	0.6	0.3	0.6	1.1	-0.7	-1.2	0%	0%	100%
51	RF0921	-0.9	-0.7	-0.2	-1.0	-0.5	0.5	0.5	0.6	2.7	-0.3	10%	0%	90%
49	RF0321	0.0	0.2	0.6	0.4	-0.2	-0.2	0.0	-0.1	0.8	-0.2	0%	0%	100%
34	RF0920	0.6	0.2	0.1	-0.1	0.4	0.4	0.1	0.2	-0.2	0.2	0%	0%	100%
35	RF0320	-0.1	-0.2	-0.3	-0.1	-0.1	-0.1	0.1	-0.3	0.6	0.1	0%	0%	100%

ZSCORE-FIX - SCC



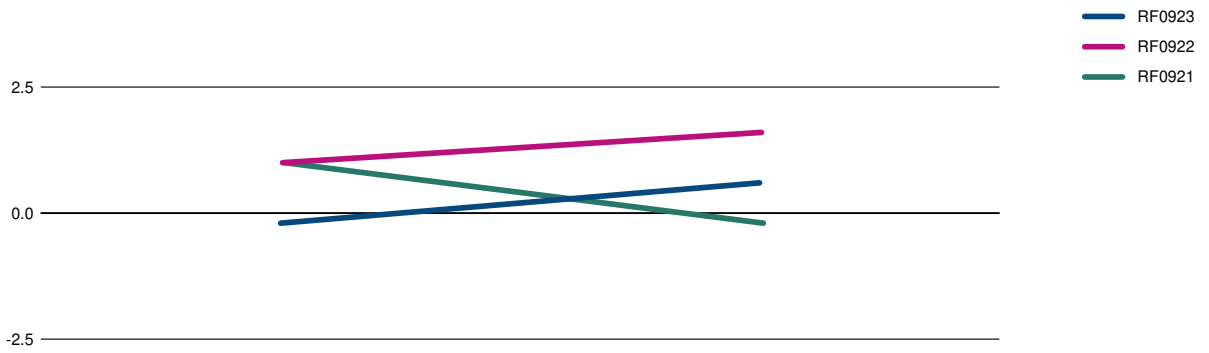
Part. code	Round	SP01	SP02	SP03	SP04	SP05	SP06	SP07	SP08	SP09	SP10	Yellow	Red	White
51	RF0923	-0.2	-0.6	0.2	0.9	0.2	2.0	0.5	0.3	1.1	1.5	0%	0%	100%
55	RF0922	0.6	0.7	1.1	0.8	0.9	0.2	0.6	0.9	0.6	0.0	0%	0%	100%
51	RF0921	-0.1	0.5	0.8	0.2	0.6	0.9	0.7	1.1	2.4	0.8	10%	0%	90%
49	RF0321	0.0	0.2	0.4	0.3	-0.1	-0.2	0.0	-0.1	1.1	-0.2	0%	0%	100%
34	RF0920	1.0	0.5	0.1	-0.1	0.5	0.6	0.3	0.4	-0.2	0.2	0%	0%	100%
35	RF0320	-0.2	-0.3	-0.4	-0.1	-0.1	-0.1	0.2	-0.5	0.9	0.2	0%	0%	100%

ZSCORE-PT - SCC - Sample A and B



Part. code	Round	Sample A	Sample B	Yellow	Red	White
51	RF0923	-0.2	0.4	0%	0%	100%
55	RF0922	1.0	0.7	0%	0%	100%
51	RF0921	-0.1	-0.6	0%	0%	100%
49	RF0321	0.0	0.0	0%	0%	100%
34	RF0920	0.0	0.0	0%	0%	100%
35	RF0320	0.1	-0.3	0%	0%	100%

ZSCORE-FIX - SCC - Sample A and B



Part. code	Round	Sample A	Sample B	Yellow	Red	White
51	RF0923	-0.2	0.6	0%	0%	100%
55	RF0922	1.0	1.6	0%	0%	100%
51	RF0921	1.0	-0.2	0%	0%	100%
49	RF0321	0.0	0.0	0%	0%	100%
34	RF0920	0.0	0.0	0%	0%	100%
35	RF0320	0.1	-0.3	0%	0%	100%



ICAR
PROFICIENCY TESTING SCHEME

September 2023

Raw Milk

Determination of FAT CONTENT

Röse Gottlieb method

Sending date of statistical treatment : 28th September 2023

Frame of activity :	ICAR Milk Analyses Sub Committee (MA SC)	
ICAR Staff	Silvia Orlandini	pt@icar.org silvia@icar.org

Proficiency test accredited ISO 17043



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Table I : Ranking of the laboratories Units : g / 100 g

Nb	%	N°	d	Sd	D	Method
1	7	8	- 0,003	0,004	0,005	A
2	13	12	- 0,005	0,006	0,008	A
3	20	10	+ 0,005	0,009	0,010	A
4	27	4	+ 0,008	0,007	0,011	A
5	33	5	- 0,005	0,011	0,013	A
6	40	13	- 0,007	0,011	0,014	A
7	47	11	+ 0,008	0,011	0,014	A
8	53	1	+ 0,011	0,009	0,014	A
9	60	6	+ 0,011	0,010	0,015	A
10	67	9	- 0,015	0,006	0,016	A
11	73	7	+ 0,016	0,004	0,016	B
12	80	14	- 0,010	0,014	0,018	A
13	87	2	- 0,014	0,016	0,021	A
14	93	3	+ 0,023	0,018	0,029	A
15	100	15	- 0,040	0,012	0,042	A

The table should be studied in parallel with figure 1 where the laboratories are located according to an acceptability area (or target) the limits of which are :

$$\pm 0,020 \text{ g / 100 g for } \bar{d} \text{ and } 0,030 \text{ g / 100 g for Sd}$$

REF : Assigned values are robust average values per sample according to algorithm A of standard ISO 13528, of 15 laboratories using the reference method ISO 1211|IDF 1, after outliers discarding using Grubbs test at 5% risk level,

- A ISO 1211|IDF 1 Röse Gottlieb Method
- B ISO 23318|IDF 249

(NC : OUT of RANKING because of insufficient data number)

(Nb : laboratory rank; % : relative rank)

(N° : laboratory identification number)

(d et Sd : mean and standard deviation of the differences (laboratory -reference))

(D : Euclidian distance to YX-axis origin = SQUARE ROOT.(d² + Sd²))

Note : Limits are only indicative and so far do not constitute standard values; they indicate what is normally reachable by labs for their self evaluation.

Repeatability standard deviation of this ICAR proficiency test (after Cochran elimination at 5 %) S_{rPT} 0,009
 Reproducibility standard deviation of this ICAR proficiency test (after Cochran and Grubbs elimination at 5 %) S_{RPT} 0,018

Table II : REPEATABILITY - Absolute difference between replicates in g / 100 g

Sample Lab code	1	2	3	4	5	6	7	8	9	10	Sr	NL
1	0,004	0,028	0,013	0,015	0,021	0,017	0,008	0,059*	0,013	0,015	0,017	20
2	0,017	0,005	0,012	0,007	0,008	0,008	0,008	0,001	0,018	0,007	0,007	20
3	0,022	0,024	0,023	0,008	0,018	0,042	**	0,034	0,021	0,019	0,018	18
4	0,011	0,001	0,008	0,019	0,001	0,000	0,004	0,003	0,002	0,013	0,006	20
5	0,008	0,013	0,010	0,003	0,001	0,002	0,005	0,007	0,007	0,009	0,005	20
6	0,013	0,000	0,012	0,007	0,000	0,004	0,008	0,009	0,001	0,007	0,005	20
7	0,007	0,013	0,012	0,009	0,010	0,000	0,008	0,027	0,016	0,004	0,009	20
8	0,002	0,009	0,002	0,006	0,001	0,000	0,002	0,007	0,002	0,000	0,003	20
9	0,008	0,000	0,006	0,003	0,013	0,024	0,004	0,009	0,001	0,006	0,007	20
10	0,000	0,005	0,000	0,003	0,004	0,010	0,002	0,003	0,004	0,013	0,004	20
11	0,001	0,011	0,002	0,011	0,013	0,010	0,013	0,009	0,018	0,019	0,009	20
12	0,010	0,000	0,030	0,010	0,020	0,010	0,010	0,000	0,030	0,000	0,011	20
13	0,020	0,010	0,030	0,010	0,000	0,010	0,000	0,010	0,010	0,010	0,010	20
14	0,030	0,003	0,017	0,000	0,014	0,028	0,001	0,002	0,003	0,002	0,010	20
15	0,002	0,008	0,001	0,015	0,003	0,004	0,002	0,004	0,004	0,000	0,004	20
Sr	0,009	0,008	0,011	0,007	0,008	0,011	0,005	0,014	0,009	0,007		298
NE	30	30	30	30	30	30	28	30	30	30		
L	0,035	0,032	0,040	0,026	0,030	0,043	0,017	0,034	0,035	0,028		

Sr : repeatability standard deviation of each laboratory limit 0,016 g/100g

NL : number of measurements per laboratory

L : Limit for difference between duplicates according Cochran test at 5% level.

SE : repeatability standard deviation per sample

NE : number of measurements per sample

*: discarded data using the test of Cochran at 5 %

** : missing data

r : limit of repeatability, absolute difference between two replicates=0,043 according ISO 1211 IDF 1D 2010

Table III : Means of the replicates in g / 100 g

Sample Lab code	1	2	3	4	5	6	7	8	9	10
1	4,717	3,492	4,205	2,141	2,813	3,832	1,465	3,085	4,574	2,430
2	4,682	3,437	4,189	2,121	2,780	3,797	1,415	3,090	4,581	2,411
3	4,745	3,497	4,202	2,150	2,856 *	3,824		3,105	4,606	2,426
4	4,718	3,479	4,217	2,126	2,803	3,828	1,445	3,094	4,590	2,427
5	4,724	3,486	4,204	2,120	2,795	3,794	1,439	3,073	4,554	2,404
6	4,733	3,496	4,209	2,133	2,813	3,845	1,430	3,098	4,577	2,421
7	4,728	3,497	4,217	2,131	2,810	3,836	1,451	3,107	4,593	2,428
8	4,716	3,474	4,193	2,117	2,796	3,812	1,436	3,086	4,567	2,414
9	4,701	3,459	4,183	2,099	2,777	3,806	1,429	3,076	4,556	2,408
10	4,695	3,489	4,208	2,125	2,804	3,832	1,442	3,099	4,583	2,419
11	4,742	3,494	4,202	2,134	2,803	3,822	1,460	3,085	4,565	2,421
12	4,715	3,480	4,195	2,125	2,790	3,805	1,435	3,080	4,555	2,410
13	4,700	3,485	4,175	2,115	2,790	3,825	1,420	3,095	4,565	2,395
14	4,663	3,479	4,190	2,119	2,784	3,800	1,441	3,088	4,562	2,414
15	4,679	3,440	4,152 *	2,101	2,757	3,763	1,414	3,052	4,518	2,364 *
M	4,710	3,479	4,199	2,123	2,794	3,815	1,437	3,087	4,570	2,416
REF.	4,711	3,482	4,199	2,123	2,796	3,817	1,438	3,088	4,570	2,416
SD	0,024	0,019	0,012	0,013	0,016	0,021	0,015	0,014	0,021	0,010

M = mean per sample

REF. = reference values

SD = standard deviation per sample

*: discarded data using the test of Grubbs at 5 %

REF : Assigned values are robust average values per sample according to algorithm A of standard ISO 13528, of 15 laboratories using the reference method ISO 1211 | IDF 1, after outliers discarding using Grubbs test at 5 % risk level.

Table IV : Outlier identification

Sample	1	2	3	4	5	6	7	8	9	10	#
Outliers Cochran								1			
Outlier Grubbs			15		3					15	
sr	0,009	0,008	0,011	0,007	0,007	0,011	0,005	0,009	0,009	0,008	
SR	0,024	0,020	0,015	0,014	0,017	0,023	0,016	0,016	0,022	0,011	

Table V : ACCURACY - differences (laboratory - reference) in g / 100 g

Sample Lab code	1	2	3	4	5	6	7	8	9	10	d	Sd _{lab}	t
1	+ 0,006	+ 0,010	+ 0,005	+ 0,018	+ 0,017	+ 0,015	+ 0,027	- 0,004	+ 0,003	+ 0,013	+ 0,011	0,009	3,94
2	- 0,029	- 0,045	- 0,010	- 0,002	- 0,016	- 0,019	- 0,023	+ 0,001	+ 0,011	- 0,006	- 0,014	0,016	2,72
3	+ 0,034	+ 0,015	+ 0,002	+ 0,027	+ 0,060	+ 0,007		+ 0,017	+ 0,035	+ 0,009	+ 0,023	0,018	3,79
4	+ 0,007	- 0,003	+ 0,018	+ 0,003	+ 0,007	+ 0,011	+ 0,007	+ 0,005	+ 0,020	+ 0,010	+ 0,008	0,007	3,98
5	+ 0,013	+ 0,004	+ 0,005	- 0,003	- 0,001	- 0,023	+ 0,001	- 0,016	- 0,017	- 0,013	- 0,005	0,011	1,39
6	+ 0,022	+ 0,014	+ 0,010	+ 0,010	+ 0,017	+ 0,028	- 0,008	+ 0,009	+ 0,006	+ 0,004	+ 0,011	0,010	3,57
7	+ 0,017	+ 0,015	+ 0,018	+ 0,008	+ 0,014	+ 0,019	+ 0,013	+ 0,018	+ 0,023	+ 0,012	+ 0,016	0,004	11,69
8	+ 0,005	- 0,008	- 0,006	- 0,006	- 0,000	- 0,005	- 0,002	- 0,003	- 0,003	- 0,002	- 0,003	0,004	2,55
9	- 0,010	- 0,023	- 0,016	- 0,024	- 0,019	- 0,011	- 0,009	- 0,013	- 0,015	- 0,008	- 0,015	0,006	8,08
10	- 0,016	+ 0,007	+ 0,009	+ 0,002	+ 0,008	+ 0,015	+ 0,004	+ 0,010	+ 0,013	+ 0,002	+ 0,005	0,009	1,99
11	+ 0,031	+ 0,012	+ 0,003	+ 0,011	+ 0,007	+ 0,006	+ 0,022	- 0,004	- 0,005	+ 0,004	+ 0,008	0,011	2,42
12	+ 0,004	- 0,002	- 0,004	+ 0,002	- 0,006	- 0,012	- 0,003	- 0,008	- 0,015	- 0,006	- 0,005	0,006	2,65
13	- 0,011	+ 0,003	- 0,024	- 0,008	- 0,006	+ 0,009	- 0,018	+ 0,007	- 0,005	- 0,021	- 0,007	0,011	2,07
14	- 0,048	- 0,003	- 0,010	- 0,004	- 0,012	- 0,017	+ 0,003	- 0,000	- 0,009	- 0,002	- 0,010	0,014	2,23
15	- 0,032	- 0,042	- 0,048	- 0,022	- 0,039	- 0,054	- 0,024	- 0,036	- 0,052	- 0,052	- 0,040	0,012	10,92
d	- 0,000	- 0,003	- 0,000	+ 0,001	- 0,002	- 0,002	- 0,000	- 0,001	- 0,001	- 0,000	- 0,001	0,018	
Sd	0,024	0,019	0,012	0,013	0,016	0,021	0,015	0,014	0,021	0,010	0,017		

d = mean of differences

Sd = standard deviation of differences

t = Student test - comparison to 0

Upper limits : $\bar{d} = \pm 0,02 \text{ g / 100 g}$ Sd = 0,03 g / 100g**ISO 1211 | IDF 1 : Precision of the method :**

Sr = 0.016 g / 100 g

SR = 0.020 g / 100 g

Table VI : Zscore of the different laboratories for each sample. ZS calculated on the PT standard deviation

Sample Lab code	1	2	3	4	5	6	7	8	9	10
1	+0,26	+0,54	+0,41	+1,31	+1,07	+0,71	+1,80	-0,28	+0,15	+1,31
2	-1,24	-2,34	-0,85	-0,18	-0,99	-0,93	-1,49	+0,08	+0,51	-0,58
3	+1,45	+0,80	+0,17	+2,01	+3,82	+0,36	+1,20	+1,68	+0,91	
4	+0,28	-0,16	+1,42	+0,20	+0,44	+0,55	+0,49	+0,37	+0,94	+1,01
5	+0,56	+0,20	+0,37	-0,25	-0,07	-1,07	+0,06	-1,15	-0,81	-1,28
6	+0,92	+0,74	+0,77	+0,71	+1,10	+1,36	-0,50	+0,66	+0,29	+0,41
7	+0,71	+0,77	+1,42	+0,57	+0,91	+0,93	+0,88	+1,31	+1,08	+1,16
8	+0,22	-0,42	-0,52	-0,44	-0,01	-0,21	-0,11	-0,21	-0,16	-0,23
9	-0,42	-1,17	-1,34	-1,81	-1,21	-0,50	-0,57	-0,93	-0,72	-0,83
10	-0,67	+0,36	+0,69	+0,12	+0,53	+0,74	+0,29	+0,73	+0,60	+0,21
11	+1,30	+0,61	+0,21	+0,79	+0,44	+0,26	+1,44	-0,28	-0,26	+0,41
12	+0,18	-0,08	-0,36	+0,16	-0,35	-0,5	-0,2	-0,61	-0,7	-0,63
13	-0,46	+0,17	-1,99	-0,58	-0,35	+0,4	-1,2	+0,48	-0,3	-2,13
14	-2,03	-0,16	-0,81	-0,29	-0,73	-0,8	+0,2	-0,03	-0,4	-0,23
15	-1,35	-2,16	-3,89	-1,66	-2,48	-2,5	-1,6	-2,63	-2,5	-5,22

In yellow the values bigger or smaller than 2/-2

In red the values bigger or smaller than 3/-3

Figure 2 : Zscore of the different laboratories for each sample. ZS calculated on the PT standard deviation

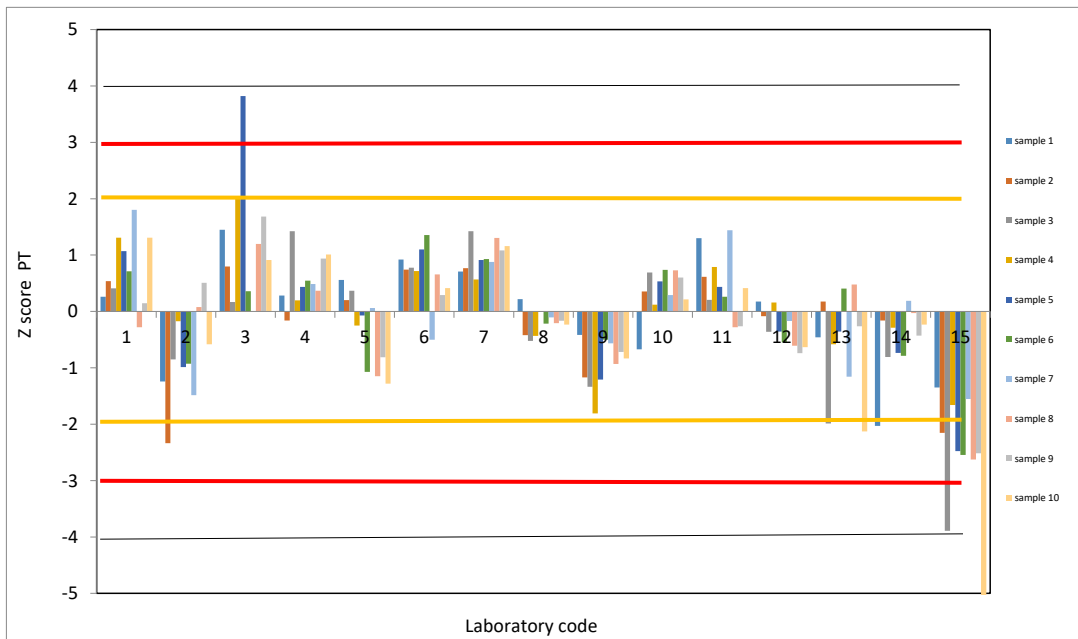


Table VII : Zscore of the different laboratories for each sample.
ZS calculated on the standard deviation of reproducibility of the method

Sample Lab code	1	2	3	4	5	6	7	8	9	10
1	+0,31	+0,52	+0,25	+0,88	+0,84	+0,75	+1,37	-0,19	+0,15	+0,66
2	-1,47	-2,26	-0,52	-0,12	-0,78	-0,97	-1,13	+0,06	+0,53	-0,29
3	+1,71	+0,77	+0,10	+1,36	+3,02	+0,37	+0,83	+1,75	+0,46	
4	+0,33	-0,16	+0,88	+0,13	+0,34	+0,57	+0,37	+0,26	+0,98	+0,51
5	+0,66	+0,19	+0,23	-0,17	-0,06	-1,13	+0,04	-0,80	-0,85	-0,64
6	+1,08	+0,72	+0,48	+0,48	+0,87	+1,42	-0,38	+0,46	+0,30	+0,21
7	+0,83	+0,74	+0,88	+0,38	+0,72	+0,97	+0,67	+0,91	+1,13	+0,58
8	+0,26	-0,41	-0,32	-0,29	-0,01	-0,23	-0,08	-0,15	-0,17	-0,12
9	-0,49	-1,13	-0,82	-1,22	-0,96	-0,52	-0,43	-0,65	-0,75	-0,42
10	-0,79	+0,34	+0,43	+0,08	+0,42	+0,77	+0,22	+0,51	+0,63	+0,11
11	+1,53	+0,59	+0,13	+0,53	+0,34	+0,28	+1,09	-0,19	-0,27	+0,21
12	+0,21	-0,08	-0,22	+0,11	-0,28	-0,58	-0,1	-0,42	-0,77	-0,32
13	-0,54	+0,17	-1,22	-0,39	-0,28	+0,43	-0,9	+0,33	-0,27	-1,07
14	-2,39	-0,16	-0,50	-0,19	-0,58	-0,83	+0,1	-0,02	-0,45	-0,12
15	-1,59	-2,08	-2,40	-1,12	-1,96	-2,68	-1,2	-1,82	-2,62	-2,62

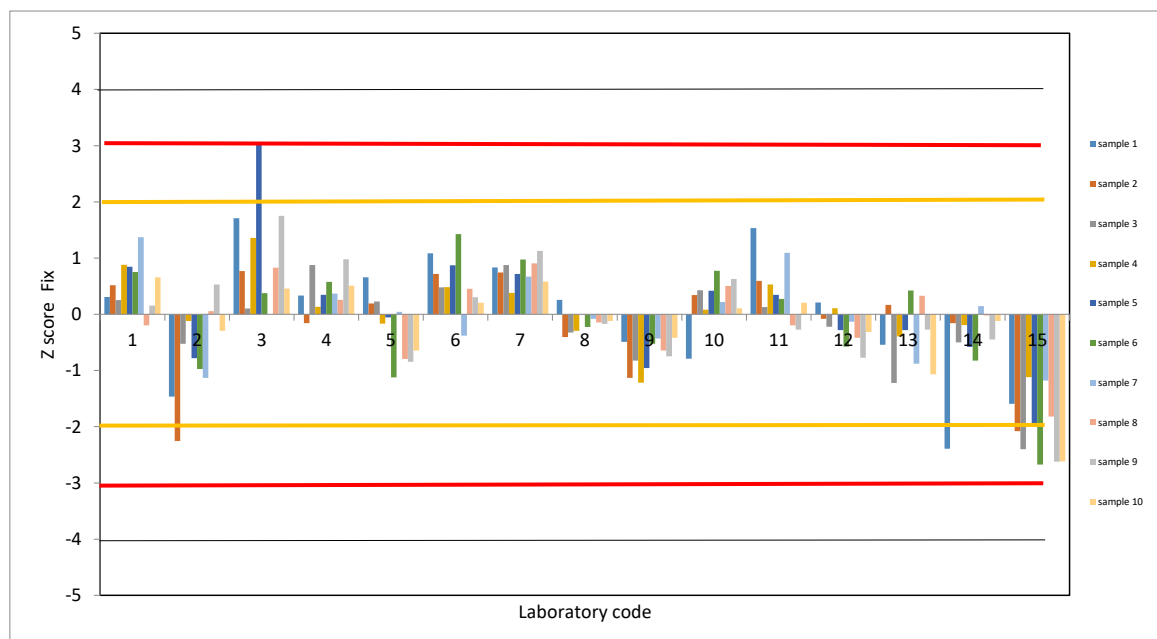
This table will allow to compare your ZSCORE from one PT to another because the standard deviation has always the value of SR of the method SR=0,02

In yellow the values bigger or smaller than 2/-

In red the values bigger or smaller than 3/-3

Figure 3 :

Zscore of the different laboratories for each sample. ZS calculated on the standard deviation of reproducibility of the method



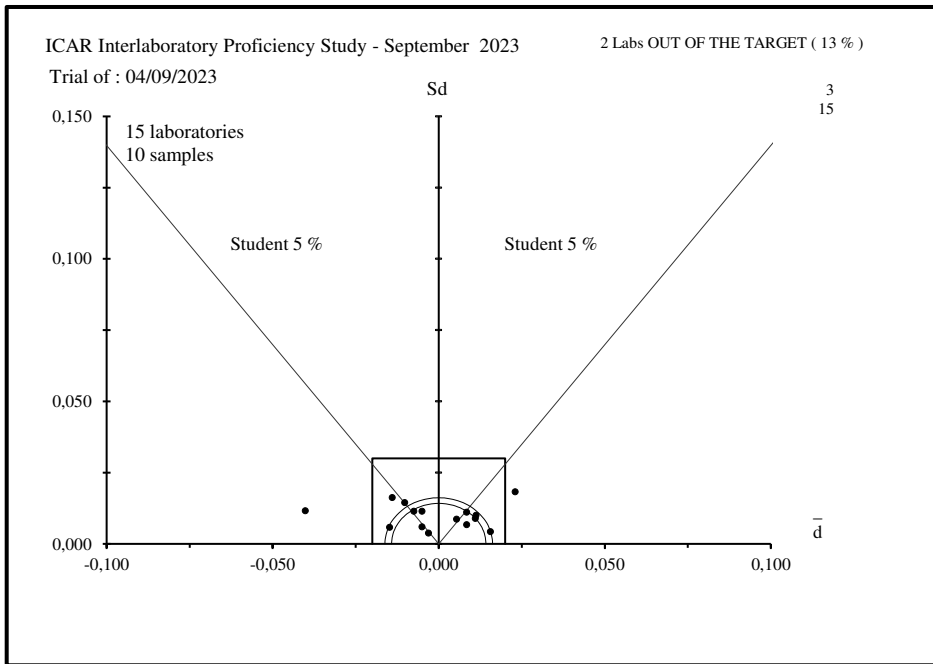


Figure 1 : ACCURACY - Evaluation of the individual performances (to see table I).



ICAR
PROFICIENCY TESTING SCHEME

September 2023

Raw Milk

Determination of CRUDE PROTEIN CONTENT
KJELDAHL Method

Sending date of statistical treatment : 28th September 2023

Frame of activity :	ICAR Milk Analyses Sub Committee (MA SC)
ICAR Staff	Silvia Orlandini pt@icar.org silvia@icar.org

Proficiency test accredited ISO 17043



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Table I : Ranking of the laboratories

Units : g / 100 g

Nb	%	N°	d	Sd	D	Method
1	7	2	+ 0,003	0,005	0,006	ISO 8968-1/IDF 20-1
2	13	14	- 0,003	0,007	0,007	ISO 8968-1/IDF 20-1
3	20	11	+ 0,007	0,005	0,009	ISO 8968-1/IDF 20-1
4	27	8	- 0,007	0,005	0,009	ISO 8968-1/IDF 20-1
5	33	4	+ 0,008	0,006	0,010	ISO 8968-1/IDF 20-1
6	40	9	- 0,011	0,005	0,012	ISO 8968-3/IDF 20-3
7	47	13	- 0,007	0,012	0,014	ISO 8968-1/IDF 20-1
8	53	7	+ 0,014	0,006	0,015	
9	60	6	+ 0,015	0,008	0,017	ISO 8968-1/IDF 20-1
10	67	12	- 0,016	0,018	0,024	ISO 8968-1/IDF 20-1
11	73	5	+ 0,019	0,019	0,026	ISO 8968-1/IDF 20-1
12	80	15	- 0,040	0,020	0,044	ISO 8968-1/IDF 20-1
13	87	10	+ 0,043	0,016	0,046	ISO 8968-1/IDF 20-1
14	93	3	- 0,039	0,035	0,052	ISO 8968-1/IDF 20-1
15	100	1	+ 0,104	0,277	0,296	ISO 8968-1/IDF 20-1

The table should be studied in parallel with figure 1 where the laboratories are located according to an acceptability area (or target) the limits of which are :

+/- 0,025 g / 100 g for \bar{d} and 0,020 g / 100 g for Sd

REF : Assigned values are robust average values per sample according to algorithm A of standard ISO 13528, of 14 laboratories using the reference method (ISO 8968-1 | IDF 20-1 and ISO 8968-3 | IDF 20-3), after outlier discarding using Grubbs test at 5% risk level

N.B. : N° 9 Kjeldahl according to ISO 8968-3/IDF 20-3
N°7 : non communiqué

(NC : OUT of RANKING because of insufficient data number)

(Nb : laboratory rank; % : relative rank)

(N° : laboratory identification number)

(d et Sd : mean and standard deviation of the differences (laboratory -reference))

(D : Euclidian distance to YX-axis origin = SQUARE ROOT.(d² + Sd²))

Note : Limits are only indicative and so far do not constitute standard values; they indicate what is normally reachable by labs for their self evaluation.

Repeatability standard deviation of this ICAR proficiency test (after Cochran elimination at 5 %)

Sr_{PT} 0,006

Reproducibility standard deviation of this ICAR proficiency test (after Cochran and Grubbs elimination at 5 %)

SR_{PT} 0,024

Table II : REPEATABILITY - Absolute difference between replicates in g / 100 g

Sample Lab Code	1	2	3	4	5	6	7	8	9	10	Sr	NL
1	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	20
2	0,004	0,003	0,006	0,004	0,002	0,003	0,002	0,002	0,003	0,008	0,003	20
3	0,006	0,010	0,005	0,020	0,009	0,001	0,010	0,027 *	0,028	0,006	0,011	20
4	0,031 *	0,006	0,011	0,004	0,006	0,007	0,011	0,007	0,008	0,001	0,009	20
5	0,008	0,011	0,003	0,014	0,006	0,011	0,001	0,011	0,154 *	0,003	0,035	20
6	0,009	0,003	0,000	0,002	0,003	0,018	0,002	0,008	0,001	0,004	0,005	20
7	0,011	0,004	0,007	0,000	0,004	0,006	0,008	0,005	0,003	0,014	0,005	20
8	0,004	0,007	0,007	0,002	0,003	0,018	0,013	0,008	0,017	0,011	0,007	20
9	0,000	0,000	0,013	0,006	0,000	0,006	0,006	0,000	0,000	0,006	0,004	20
10	0,001	0,015	0,011	0,012	0,010	0,024	0,030	0,017	0,004	0,014	0,011	20
11	0,004	**	0,015	0,001	0,001	0,010	0,004	0,006	**	0,009	0,005	16
12	0,050 *	0,050 *	0,010	0,010	0,010	0,010	0,020	0,010	0,020	0,010	0,018	20
13	0,012	0,027 *	0,015	0,003	0,002	0,006	0,005	0,003	0,001	0,009	0,008	20
14	0,001	0,006	0,008	0,007	0,007	0,008	0,015	0,002	0,000	0,003	0,005	20
15	0,005	0,009	0,020	0,011	0,014	0,009	0,013	0,003	0,004	0,012	0,008	20
Sr	0,012	0,012	0,007	0,006	0,005	0,008	0,009	0,007	0,030	0,006		296
NE	30	28	30	30	30	30	30	30	28	30		
L	0,016	0,020	0,027	0,023	0,017	0,029	0,033	0,020	0,028	0,023		

Sr : repeatability standard deviation of each laboratory limit 0,014 g /100g

NL : number of measurements per laboratory

L : Limit for difference between duplicates according Cochran test at 5% level.

SE : repeatability standard deviation per sample

NE : number of measurements per sample

*: discarded data using the test of Cochran at 5 %

** : missing data

r : limit of repeatability, absolute difference between two replicates=0,040 according ISO 8968-1 | IDF 20-1

Table III : Means of the replicates in g / 100 g

Sample Lab Code	1	2	3	4	5	6	7	8	9	10
1	3,711	3,376 *	3,622	2,723	2,947	3,599 *	3,150 *	3,095	4,529 *	2,846
2	3,685	3,298	3,581	2,721	2,906	3,490	3,318	3,101	3,680	2,813
3	3,642	3,256	3,549	2,653	2,859	3,494	3,206 *	3,086	3,674	2,756
4	3,689	3,297	3,590	2,735	2,915	3,493	3,310	3,107	3,681	2,823
5	3,713	3,318	3,614	2,736	2,923	3,513	3,338	3,123	3,634	2,834
6	3,695	3,297	3,591	2,734	2,924	3,491	3,336	3,125	3,688	2,835
7	3,687	3,307	3,586	2,737	2,923	3,501	3,327	3,112	3,691	2,831
8	3,662	3,284	3,568	2,711	2,908	3,480	3,315	3,094	3,661	2,805
9	3,675	3,279	3,566	2,715	2,897	3,468	3,302	3,088	3,656	2,804
10	3,716	3,328	3,606	2,758	2,933	3,532	3,360	3,141	3,739 *	2,877
11	3,687		3,586	2,734	2,918	3,490	3,318	3,115		2,813
12	3,615	3,275	3,555	2,715	2,895	3,475	3,310	3,095	3,660	2,805
13	3,679	3,319	3,570	2,712	2,895	3,476	3,295	3,086	3,663	2,797
14	3,662	3,289	3,579	2,721	2,906	3,480	3,312	3,100	3,676	2,812
15	3,651	3,297	3,533	2,666	2,845	3,448	3,276	3,051	3,641	2,756
M	3,678	3,296	3,580	2,718	2,906	3,488	3,317	3,101	3,667	2,814
REF.	3,678	3,294	3,580	2,721	2,909	3,487	3,313	3,100	3,665	2,812
SD	0,028	0,020	0,024	0,027	0,026	0,020	0,021	0,021	0,018	0,031

M = mean per sample

REF. = reference values

SD = standard deviation per sample

*: discarded data using the test of Grubbs 5 %

REF : Assigned values are robust average values per sample according to algorithm A of standard ISO 13528, of 14 laboratories using the reference method ISO 8968-1 | IDF 20-1 and ISO 8968-3 | IDF 20-3, after outliers discarding using Grubbs test at 5 % risk level.

Table IV : Outlier identification

Sample	1	2	3	4	5	6	7	8	9	10
Outliers Cochran	4, 12	12, 13						3	5	
Outlier Grubbs		1				1	1, 3		1, 10	
sr	0,004	0,006	0,007	0,006	0,005	0,008	0,009	0,005	0,008	0,006
SR	0,024	0,020	0,025	0,027	0,027	0,021	0,022	0,022	0,016	0,031

Table V : ACCURACY - differences (laboratory - reference) in g / 100 g

Sample Lab code	1	2	3	4	5	6	7	8	9	10	d	Sd _{lab}	t
1	+ 0,033	+ 0,082	+ 0,042	+ 0,002	+ 0,038	+ 0,112	- 0,163	- 0,005	+ 0,864	+ 0,034	+ 0,104	0,277	1,19
2	+ 0,007	+ 0,003	+ 0,002	- 0,000	- 0,003	+ 0,003	+ 0,005	+ 0,001	+ 0,015	+ 0,001	+ 0,003	0,005	2,05
3	- 0,036	- 0,039	- 0,031	- 0,068	- 0,050	+ 0,007	- 0,107	- 0,015	+ 0,009	- 0,056	- 0,039	0,035	3,49
4	+ 0,010	+ 0,003	+ 0,010	+ 0,014	+ 0,006	+ 0,006	- 0,004	+ 0,006	+ 0,016	+ 0,010	+ 0,008	0,006	4,29
5	+ 0,035	+ 0,024	+ 0,035	+ 0,015	+ 0,014	+ 0,027	+ 0,025	+ 0,023	- 0,031	+ 0,022	+ 0,019	0,019	3,18
6	+ 0,016	+ 0,002	+ 0,011	+ 0,012	+ 0,015	+ 0,004	+ 0,023	+ 0,024	+ 0,023	+ 0,023	+ 0,015	0,008	6,10
7	+ 0,009	+ 0,013	+ 0,006	+ 0,016	+ 0,014	+ 0,014	+ 0,014	+ 0,012	+ 0,027	+ 0,019	+ 0,014	0,006	8,19
8	- 0,016	- 0,010	- 0,012	- 0,011	- 0,001	- 0,007	+ 0,002	- 0,006	- 0,004	- 0,007	- 0,007	0,005	4,33
9	- 0,003	- 0,015	- 0,013	- 0,006	- 0,012	- 0,019	- 0,012	- 0,013	- 0,009	- 0,008	- 0,011	0,005	7,79
10	+ 0,038	+ 0,034	+ 0,026	+ 0,037	+ 0,024	+ 0,045	+ 0,047	+ 0,040	+ 0,074	+ 0,065	+ 0,043	0,016	8,57
11	+ 0,008		+ 0,006	+ 0,013	+ 0,009	+ 0,003	+ 0,005	+ 0,014		+ 0,001	+ 0,007	0,005	4,44
12	- 0,063	- 0,019	- 0,025	- 0,006	- 0,014	- 0,012	- 0,003	- 0,005	- 0,005	- 0,007	- 0,016	0,018	2,81
13	+ 0,001	+ 0,024	- 0,010	- 0,009	- 0,014	- 0,011	- 0,018	- 0,014	- 0,002	- 0,015	- 0,007	0,012	1,72
14	- 0,017	- 0,005	- 0,001	- 0,001	- 0,003	- 0,007	- 0,002	- 0,000	+ 0,011	- 0,001	- 0,003	0,007	1,15
15	- 0,028	+ 0,002	- 0,047	- 0,056	- 0,064	- 0,039	- 0,037	- 0,050	- 0,024	- 0,056	- 0,040	0,020	6,43
d	- 0,000	+ 0,001	+ 0,000	- 0,003	- 0,003	+ 0,001	+ 0,003	+ 0,001	+ 0,002	+ 0,002	+ 0,007	0,077	
Sd	0,028	0,020	0,024	0,027	0,026	0,020	0,021	0,021	0,018	0,031	0,024		

d = mean of differences Sd = standard deviation of differences t = Student test - comparison to 0

Upper limits : $\bar{d} = \pm 0,025 \text{ g / 100 g}$ Sd = 0,020 g / 100 g

ISO 8968-1 | IDF 20-1 : Precision of the method : Sr = 0.014 g / 100 g
SR = 0.018 g / 100 g

Table VI : Zscore of the different laboratories for each sample. ZS calculated on the PT standard deviation

Sample Lab Code	1	2	3	4	5	6	7	8	9	10
1	+1,17	+4,12	+1,76	+0,07	+1,44	+5,54	-7,79	-0,26	+48,45	+1,09
2	+0,24	+0,16	+0,06	-0,00	-0,12	+0,14	+0,22	+0,03	+0,83	+0,02
3	-1,29	-1,95	-1,29	-2,52	-1,89	+0,36	-5,12	-0,70	+0,49	-1,80
4	+0,37	+0,14	+0,41	+0,51	+0,23	+0,28	-0,18	+0,29	+0,90	+0,33
5	+1,25	+1,21	+1,44	+0,54	+0,52	+1,32	+1,18	+1,08	-1,71	+0,71
6	+0,59	+0,11	+0,46	+0,46	+0,57	+0,21	+1,11	+1,14	+1,31	+0,73
7	+0,32	+0,64	+0,26	+0,59	+0,53	+0,70	+0,68	+0,55	+1,49	+0,62
8	-0,58	-0,52	-0,48	-0,39	-0,05	-0,32	+0,09	-0,31	-0,23	-0,22
9	-0,12	-0,76	-0,55	-0,24	-0,47	-0,95	-0,55	-0,59	-0,51	-0,27
10	+1,36	+1,72	+1,08	+1,38	+0,90	+2,25	+2,23	+1,91	+4,17	+2,08
11	+0,30		+0,26	+0,49	+0,33	+0,15	+0,22	+0,67		+0,02
12	-2,27	-0,97	-1,02	-0,23	-0,53	-0,58	-0,15	-0,26	-0,27	-0,23
13	+0,03	+1,22	-0,40	-0,32	-0,53	-0,53	-0,86	-0,67	-0,10	-0,49
14	-0,60	-0,27	-0,02	-0,02	-0,13	-0,34	-0,08	-0,02	+0,62	-0,02
15	-0,99	+0,11	-1,94	-2,05	-2,42	-1,93	-1,75	-2,35	-1,34	-1,82

In yellow the values bigger or smaller than 2/-2

In red the values bigger or smaller than 3/-3

Figure 2 : Zscore of the different laboratories for each sample. ZS calculated on the PT standard deviation

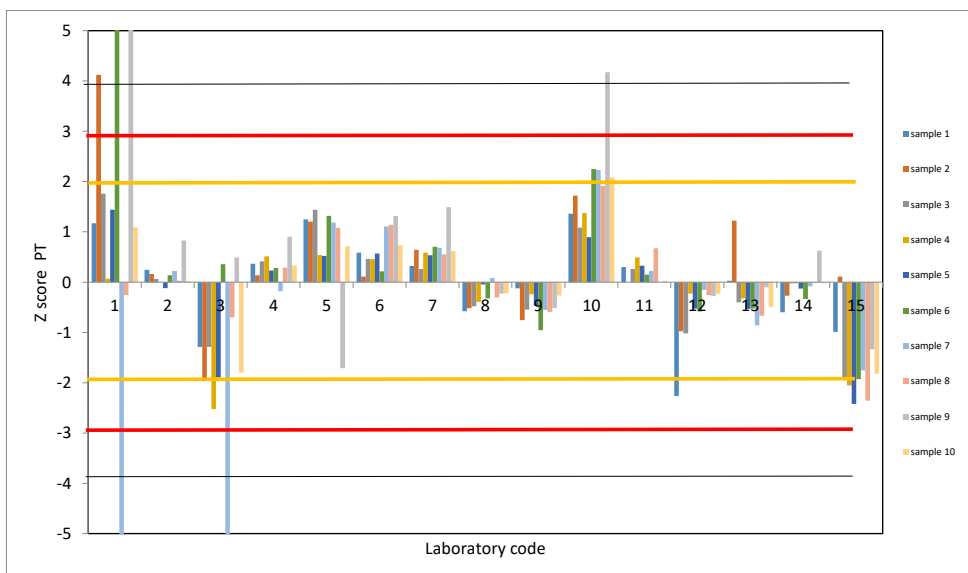


Table VII : Zscore of the different laboratories for each sample. ZS calculated on the standard deviation of reproducibility of the method

Sample/Lab code	1	2	3	4	5	6	7	8	9	10
1	+1,82	+4,54	+2,36	+0,10	+2,12	+6,23	-9,07	-0,30	+48,01	+1,88
2	+0,38	+0,18	+0,08	-0,00	-0,17	+0,15	+0,26	+0,03	+0,82	+0,04
3	-2,00	-2,14	-1,72	-3,80	-2,78	+0,40	-5,96	-0,82	+0,48	-3,10
4	+0,57	+0,15	+0,55	+0,77	+0,34	+0,32	-0,21	+0,34	+0,90	+0,57
5	+1,94	+1,33	+1,93	+0,81	+0,77	+1,48	+1,38	+1,27	-1,69	+1,23
6	+0,91	+0,12	+0,62	+0,69	+0,84	+0,24	+1,29	+1,34	+1,30	+1,26
7	+0,50	+0,71	+0,35	+0,88	+0,78	+0,79	+0,79	+0,65	+1,48	+1,07
8	-0,90	-0,57	-0,64	-0,59	-0,07	-0,36	+0,10	-0,36	-0,22	-0,39
9	-0,19	-0,83	-0,73	-0,36	-0,69	-1,07	-0,64	-0,70	-0,51	-0,46
10	+2,11	+1,90	+1,45	+2,07	+1,31	+2,53	+2,60	+2,25	+4,14	+3,58
11	+0,47		+0,35	+0,74	+0,48	+0,17	+0,26	+0,79		+0,04
12	-3,52	-1,07	-1,37	-0,34	-0,77	-0,66	-0,18	-0,30	-0,27	-0,40
13	+0,04	+1,35	-0,54	-0,48	-0,78	-0,59	-1,00	-0,78	-0,10	-0,85
14	-0,93	-0,30	-0,03	-0,04	-0,19	-0,38	-0,10	-0,02	+0,62	-0,04
15	-1,54	+0,12	-2,59	-3,09	-3,56	-2,17	-2,04	-2,77	-1,32	-3,13

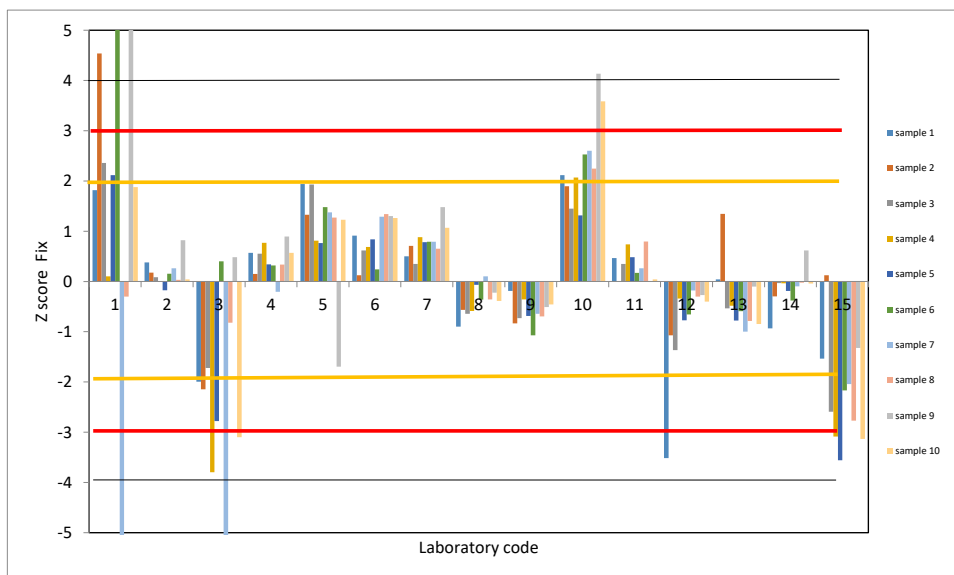
This table will allows to compare your ZSCORE from one PT to an other because the standard deviation has always the value of SR of the method SR=0,018

In yellow the values bigger or smaller than 2/-2

In red the values bigger or smaller than 3/-3

Figure 3 :

Zscore of the different laboratories for each sample. ZS calculated on the standard deviation of reproducibility of the method



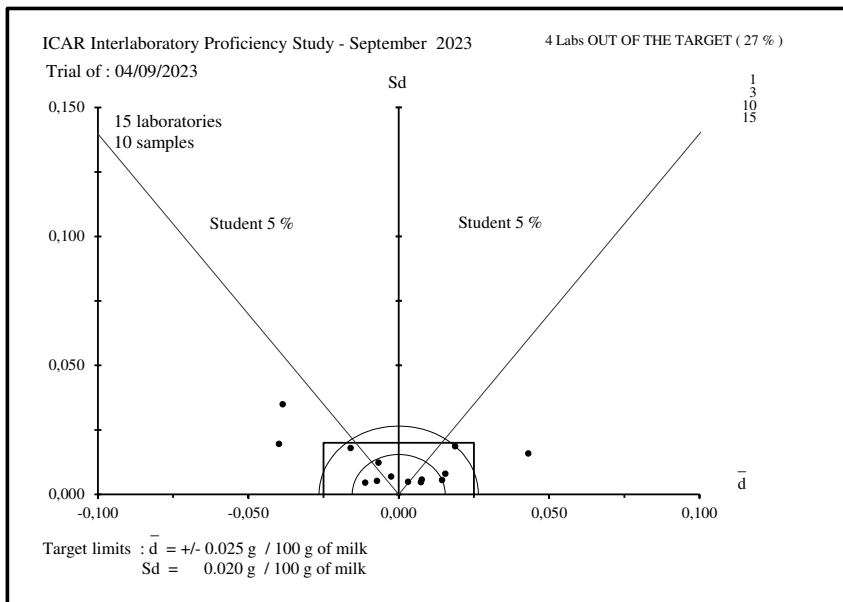


Figure 1 : ACCURACY - Evaluation of the individual performances (to see table I).

Table VIII : Relative recovery of nitrogen on pure solutions

N°	TRYP	GLY	SO4
1	122,6	135,8	88,5
2	98,1	100,3	100,7
3			101,3
4	100,5	100,6	101,1
5	99,8	100,9	101,1
6	99,5	101,5	101,7
7	99,9	101,0	101,1
8	97,5	100,2	100,5
9	99,3	100,2	100,6
10	100,5	100,6	100,7
11	99,6	100,3	100,5
12	99,5	100,5	100,5
13	98,0	100,1	100,1
14	15,6	15,7	15,6
15		99,5	

TRY = Tryptophan solution to 5,60 g N/l
 GLY = Glycine solution to 5.60 g N/l
 SO4 = Ammonium sulfate solution to 5.60 g N/l

TRYP : recovery 97 à 101 %
 GLY : recovery 99 à 101 %
 SO4 : recovery 99 à 101 %



DETERMINATION of LACTOSE in F

ICAR
PROFICIENCY TESTING SCHEME

September 2023

Raw Milk

Determination of LACTOSE CONTENT

Sending date of statistical treatment : 28th September 2023

Frame of activity :	ICAR Milk Analyses Sub Committee (MA SC)		
ICAR Staff	Silvia Orlandini	pt@icar.org	silvia@icar.org



Table I : Ranking of the laboratories Units : g / 100 g

Nb	%	N°	d	Sd	D	Method
1	11	2	+ 0,008	0,015	0,017	ISO 22662 / IDF 198
2	22	9	- 0,024	0,021	0,032	LC-PULSE AMPEROM
3	33	3	+ 0,034	0,013	0,037	ISO 22662 / IDF 198
4	44	1	+ 0,043	0,017	0,046	HPLC
5	56	7	- 0,046	0,012	0,048	Enzymatic method ir
6	67	5	+ 0,066	0,025	0,070	Lane-Eynon method
7	78	4	- 0,068	0,037	0,077	ISO 26462 / IDF 214
8	89	6	+ 0,083	0,023	0,087	ISO 22662 / IDF 198
9	100	8	- 0,175	0,043	0,180	ISO 22662 / IDF 198

(NC : OUT of RANKING because of insufficient data number)

(Nb : laboratory rank; % : relative rank)

(N° : laboratory identification number)

(d et Sd : mean and standard deviation of the differences (laboratory -reference))

(D : Euclidian distance to YX-axis origin = SQUARE ROOT.(d² + Sd²))

The table should be studied in parallel with figure 1 where the laboratories are located according to an acceptability area (or target) the limits of which are :

$$\pm 0.100 \text{ g / 100 g for } d \text{ and } 0.100 \text{ g / 100g for } Sd$$

REF : Assigned values are robust average values per sample according to algorithm A of standard ISO 13528, of 9 laboratories , after outliers disca using Grubbs test at 5 % risk level.

Note : Limits are only indicative and so far do not constitute standard val reachable by labs for their self evaluation.

Repeatability standard deviation of this ICAR proficiency test (after Cochran elir
Reproducibility standard deviation of this ICAR proficiency test (after Cochran a



Sr_{PT} 0,014
SR_{PT} 0,073

ICAR Proficiency Test September 2023

Y - Absolute difference between replicates in g / 100 g

4	5	6	7	8	9	10	Sr	NL
0,001	0,001	0,006	0,005	0,001	0,006	0,007	0,003	20
0,005	0,004	0,009	0,032	0,025	0,022	0,005	0,011	20
0,022	0,006	0,000	0,008	0,004	0,005	0,009	0,007	20
0,044	0,022	0,052 *	0,032	0,078 *	0,059	0,041	0,036	20
0,006	0,008	0,007	0,008	0,006	0,025	0,025	0,009	20
0,006	0,000	0,000	0,004	0,008	0,012	0,007	0,007	20
0,012	0,000	0,008	0,022	0,012	0,015	0,009	0,008	20
0,001	0,014	0,013	0,001	0,027	0,093	0,011	0,044	20
0,027	0,020	0,012	0,002	0,017	0,024	0,000	0,012	20
0,014	0,008	0,013	0,012	0,021	0,028	0,012		180
18	18	18	18	18	18	18		
0,047	0,028	0,019	0,042	0,036	0,095	0,042		

each laboratory limit 0,022 g/100g

laboratory

is according Cochran test at 5% level.

for sample

value

analysis at 5 %

variance between two replicates=0,061 according ISO 22662 / IDF 198

Table III : Means of the replicates in g / 100 g

Sample Lab code	1	2	3	4	5	6	7	8	9	10	LACT
1	4,889	5,091	4,950	5,026	4,835	4,750	4,771	4,723	4,803	4,767	4,877
2	4,823	5,041	4,890	4,985	4,795	4,750	4,756	4,685	4,774	4,760	4,898
3	4,875	5,082	4,945	5,012	4,817	4,738	4,758	4,709	4,792	4,791	4,911
4	4,736	4,930	4,837	4,913	4,775	4,627	4,729	4,529	4,710	4,715	4,839
5	4,915	5,146	4,994	5,048	4,862	4,760	4,791	4,711	4,806	4,804	4,920
6	4,922	5,147	4,979	5,065	4,894	4,798	4,827	4,764	4,819	4,797	4,846
7	4,779	4,988	4,849	4,933	4,753	4,664	4,667	4,639	4,724	4,723	4,748
8	4,595	4,891	4,779	4,805	4,624	4,620	4,541	4,470	4,571 *	4,538 *	4,620
9	4,780	5,001	4,884	4,994	4,773	4,684	4,701	4,673	4,739	4,707	4,780
M	4,812	5,035	4,900	4,975	4,792	4,710	4,727	4,656	4,771	4,758	
REF.	4,821	5,035	4,901	4,983	4,800	4,710	4,738	4,661	4,771	4,758	4,912
SD	0,105	0,090	0,072	0,081	0,078	0,063	0,084	0,096	0,041	0,039	

M = mean per sample

REF. = reference values

SD = standard deviation per sample

*: discarded data using the test of Grubbs 5 %

REF : Assigned values are robust average values per sample according to algorithm A of standard ISO 135: of 9 laboratories, after outliers discarding using Grubbs test at 5 % risk level.

Table IV : Outlier identification

Sample	1	2	3	4	5	6	7	8	9	10
Outliers Cochran	8	4				4		4		
Outlier Grubbs									8	8
sr	0,006	0,010	0,005	0,014	0,008	0,006	0,012	0,011	0,019	0,013
SR	0,070	0,087	0,072	0,082	0,078	0,059	0,085	0,090	0,043	0,040

Table V : ACCURACY - differences (laboratory - reference) in g / 100 g

Sample Lab code	1	2	3	4	5	6	7	8	9	10
1	+ 0,068	+ 0,056	+ 0,049	+ 0,043	+ 0,034	+ 0,040	+ 0,033	+ 0,061	+ 0,032	+ 0,009
2	+ 0,002	+ 0,006	- 0,011	+ 0,002	- 0,005	+ 0,040	+ 0,018	+ 0,023	+ 0,003	+ 0,002
3	+ 0,054	+ 0,047	+ 0,044	+ 0,029	+ 0,017	+ 0,028	+ 0,020	+ 0,048	+ 0,021	+ 0,033
4	- 0,085	- 0,105	- 0,064	- 0,070	- 0,025	- 0,083	- 0,009	- 0,132	- 0,061	- 0,043
5	+ 0,094	+ 0,111	+ 0,093	+ 0,065	+ 0,062	+ 0,050	+ 0,053	+ 0,050	+ 0,035	+ 0,046
6	+ 0,101	+ 0,112	+ 0,078	+ 0,082	+ 0,094	+ 0,088	+ 0,089	+ 0,103	+ 0,048	+ 0,039
7	- 0,042	- 0,047	- 0,052	- 0,050	- 0,047	- 0,046	- 0,071	- 0,022	- 0,047	- 0,035
8	- 0,226	- 0,144	- 0,122	- 0,178	- 0,176	- 0,090	- 0,197	- 0,192	- 0,200	- 0,220
9	- 0,041	- 0,034	- 0,017	+ 0,011	- 0,027	- 0,026	- 0,037	+ 0,011	- 0,032	- 0,051
d	- 0,008	+ 0,000	- 0,000	- 0,007	- 0,008	- 0,000	- 0,011	- 0,006	- 0,000	- 0,000
Sd	0,105	0,090	0,072	0,081	0,078	0,063	0,084	0,096	0,041	0,039

d = mean of differences

Sd = standard deviation of differences

t = Student test - comparison to

Upper limits : $\bar{d} = \pm 0.100 \text{ g} / 100\text{g}$ Sd = 0.100 g / 100g

ISO 22662 | IDF 198 : Precision of the method :

Sr = 0.022 g / 100 g

SR = 0.047 g / 100 g

ICAR Proficiency Test September 2023

Table VI : Zscore of the different laboratories fo ZS calculated on the PT standard devi

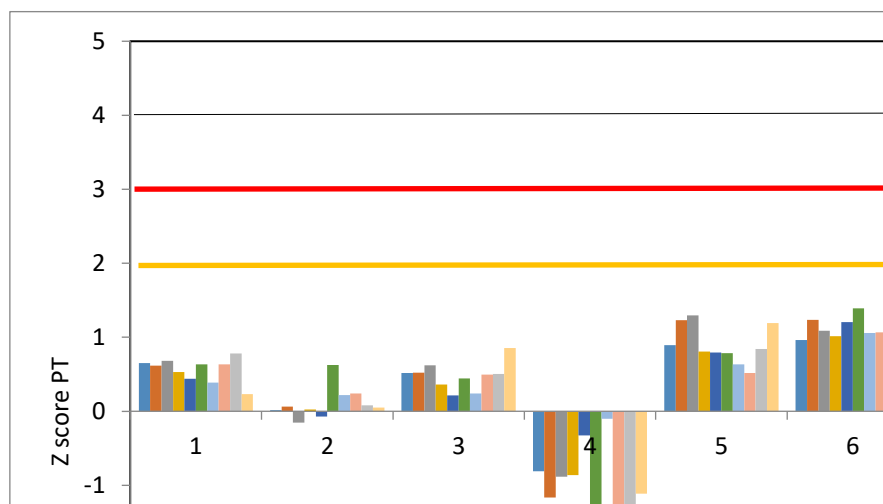
d	Sd _{lab}	t
0,043	0,017	7,87
0,008	0,015	1,67
0,034	0,013	8,10
0,068	0,037	5,85
0,066	0,025	8,33
0,083	0,023	11,34
0,046	0,012	11,79
0,175	0,043	12,71
0,024	0,021	3,72
0,009	0,080	
0,078		

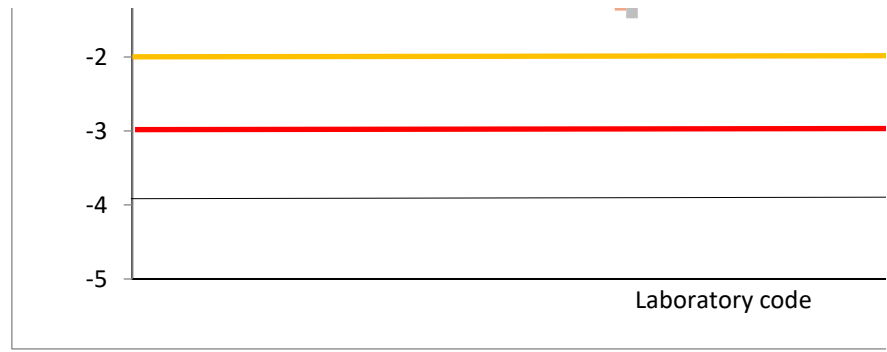
Sample Lab code	1	2	3	4	5	6
1	+0,65	+0,62	+0,68	+0,53	+0,44	+0,63
2	+0,02	+0,06	-0,15	+0,02	-0,07	+0,63
3	+0,52	+0,52	+0,62	+0,36	+0,21	+0,44
4	-0,81	-1,17	-0,89	-0,86	-0,33	-1,31
5	+0,89	+1,23	+1,30	+0,81	+0,79	+0,78
6	+0,96	+1,23	+1,09	+1,02	+1,21	+1,39
7	-0,40	-0,52	-0,73	-0,61	-0,61	-0,73
8	-2,16	-1,59	-1,70	-2,20	-2,27	-1,43
9	-0,39	-0,38	-0,24	+0,13	-0,35	-0,41

In yellow the values bigger or smaller than 2/-2

0

Figure 2 : Zscore of the different laboratories for each sample. ZS calcula





ICAR Proficiency Test September 2023

for each sample.
variation

7	8	9	10
+0,39	+0,64	+0,78	+0,23
+0,22	+0,24	+0,08	+0,05
+0,24	+0,50	+0,50	+0,85
-0,10	-1,37	-1,48	-1,12
+0,63	+0,52	+0,84	+1,19
+1,06	+1,07	+1,17	+1,01
-0,84	-0,23	-1,14	-0,91
-2,34	-1,99	-4,83	-5,70
-0,44	+0,12	-0,76	-1,31

6

In red the values bigger or smaller than 3/-3

Table VII : Zscore
ZS calcul

Sample Lab code	1	2
1	+1,45	+1,18
2	+0,04	+0,12
3	+1,15	+1,00
4	-1,80	-2,24
5	+1,99	+2,36
6	+2,14	+2,37
7	-0,89	-1,01
8	-4,81	-3,06
9	-0,88	-0,73

This table will allows to compare
has always the value of SR c

In yellow the values bigger c

based on the PT standard deviation

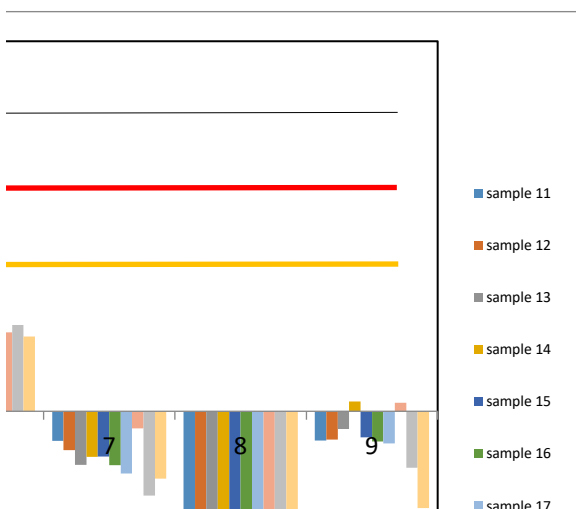
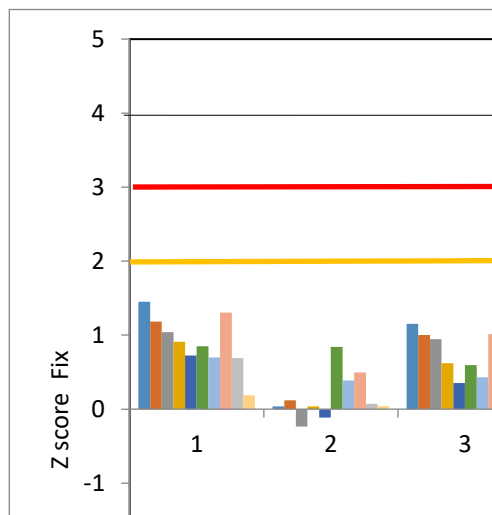
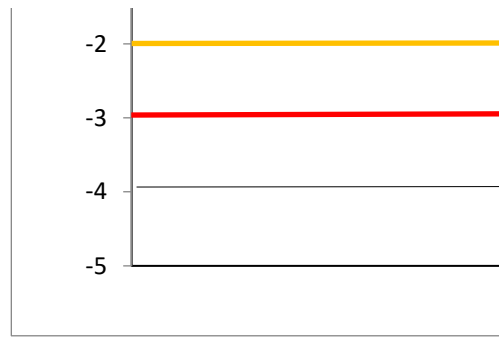
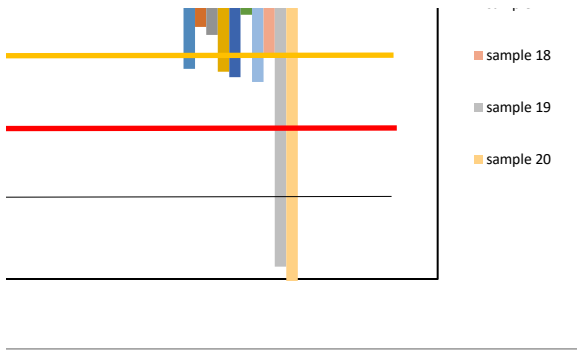


Figure 3 :

Zscore of the different laboratories for each





of the different laboratories for each sample.
 ulated on the standard deviation of reproducibility of the method

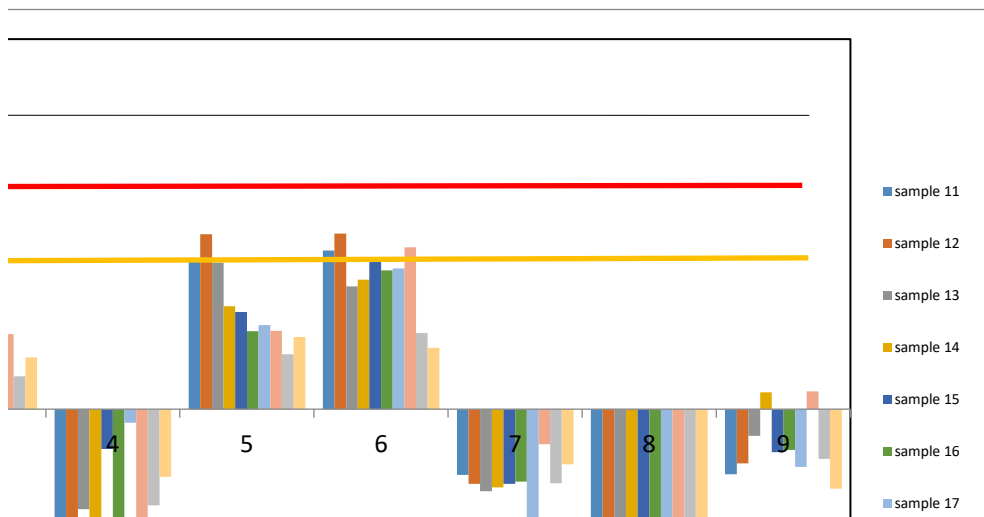
3	4	5	6	7	8	9	10
+1,04	+0,91	+0,73	+0,85	+0,70	+1,30	+0,69	+0,19
-0,24	+0,04	-0,11	+0,84	+0,39	+0,49	+0,07	+0,04
+0,95	+0,62	+0,35	+0,60	+0,43	+1,02	+0,44	+0,70
-1,35	-1,48	-0,54	-1,76	-0,19	-2,81	-1,30	-0,92
+1,98	+1,39	+1,31	+1,05	+1,13	+1,06	+0,74	+0,98
+1,66	+1,75	+1,99	+1,87	+1,90	+2,19	+1,03	+0,83
-1,11	-1,06	-1,01	-0,98	-1,50	-0,47	-1,00	-0,75
-2,60	-3,79	-3,75	-1,92	-4,20	-4,08	-4,26	-4,68
-0,36	+0,23	-0,58	-0,55	-0,78	+0,24	-0,67	-1,08

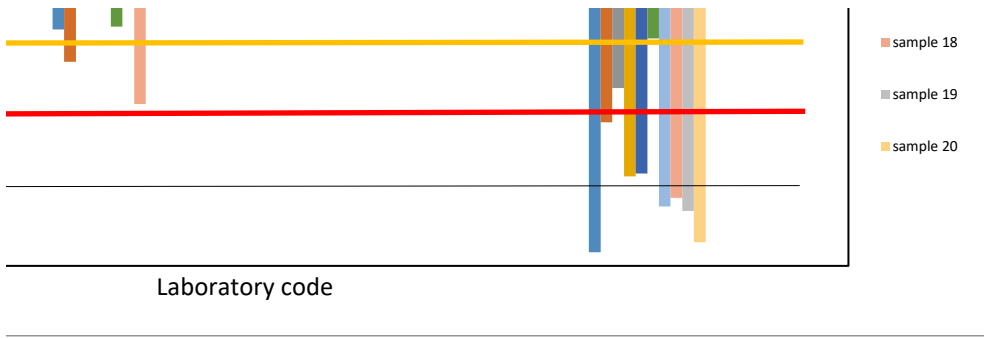
pare your ZSCORE from one PT to an other because the standard deviation
 of the method SR=0,047

or smaller than 2/-2

In red the values bigger or smaller than 3/-3

ch sample. ZS calculated on the standard deviation of reproducibility of the method





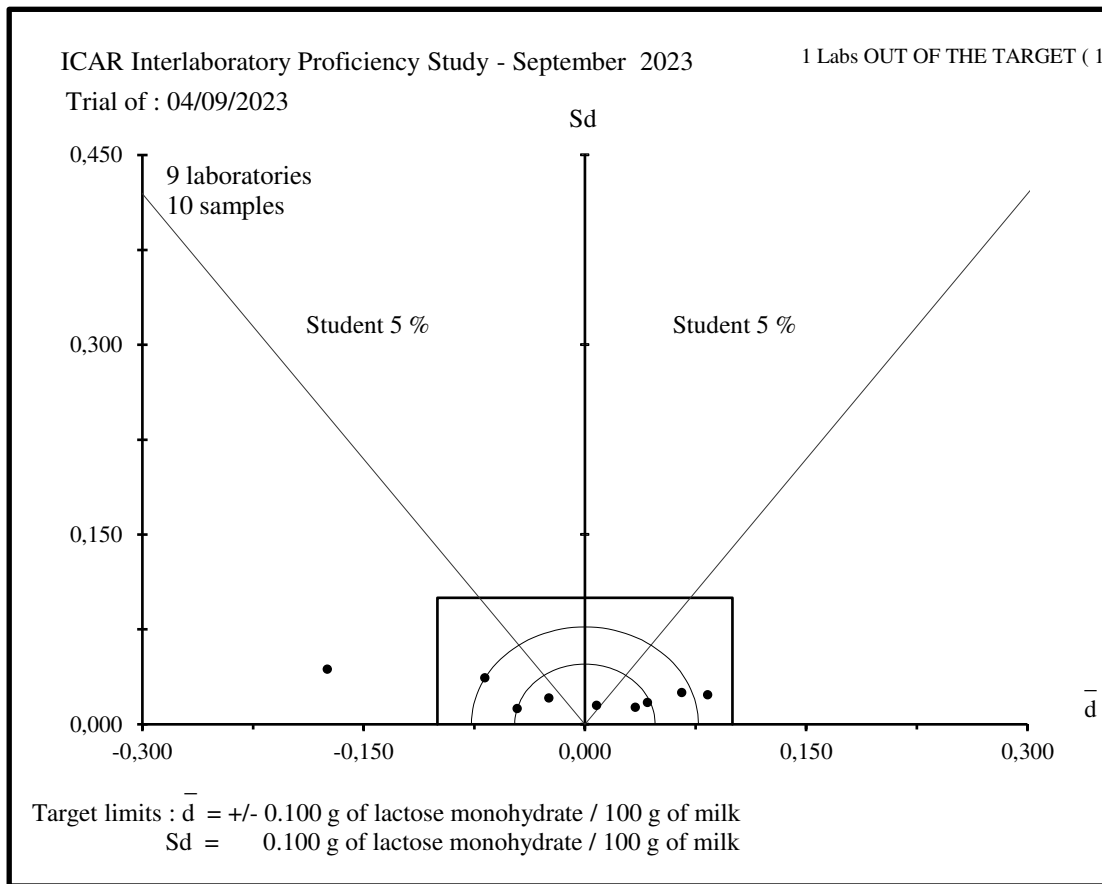


Figure 1 : ACCURACY - Evaluation of the individual performances (to see table I).

.1 %)
8



ICAR
PROFICIENCY TESTING SCHEME

September 2023

Raw Milk

Determination of UREA CONTENT

Sending date of statistical treatment : 28th September 2023

Frame of activity :	ICAR Milk Analyses Sub Committee (MA SC)
ICAR Staff	Silvia Orlandini pt@icar.org silvia@icar.org



Table I : Ranking of the laboratories

Units : mg / dl

Nb	%	N°	d	Sd	D	Method
1	14	2	- 0,06	0,58	0,58	ISO 14637 / IDF 195
2	29	4	+ 0,13	0,72	0,73	ISO 14637 / IDF 195
3	43	3	+ 1,10	0,59	1,25	Skalar 612-322
4	57	7	- 0,45	1,24	1,32	enzymatische Bestimmung
5	71	5	+ 0,97	1,11	1,48	ISO 14637 / IDF 195
6	86	6	- 4,47	2,72	5,23	Enzymatic method in house
7	100	1	- 25,31	14,91	29,38	ISO 14637 / IDF 195

The table should be studied in parallel with figure 1 where the laboratories are located according to an acceptability area (or target) the limits of which are :

$$\pm 2,50 \text{ mg / dl for } \bar{d} \text{ and } 1,50 \text{ mg / dl for } Sd$$

REF : Assigned values are robust average values per sample according to algorithm A of standard ISO 13528, of 4 laboratories using reference method (ISO 14637|IDF 195 or V 04-217), after outlier discarding using Grubbs test at 5% risk level

(NC : OUT of RANKING because of insufficient data number)

(Nb : laboratory rank; % : relative rank)

(N° : laboratory identification number)

(d et Sd : mean and standard deviation of the differences (laboratory -reference))

(D : Euclidian distance to YX-axis origin = SQUARE ROOT.(d² + Sd²))

Note : Limits are only indicative and so far do not constitute standard values; they indicate what is normally reachable by labs for their self evaluation.

Repeatability standard deviation of this ICAR proficiency test (after Cochran elimination at 5 %)

S_{rPT} 0,40

Reproducibility standard deviation of this ICAR proficiency test (after Cochran and Grubbs elimination at 5 %)

S_{RPT} 1,25

Table II : REPEATABILITY - Absolute difference between replicates in mg / dl

Sample Lab Code	1	2	3	4	5	6	7	8	9	10	Sr	NL
1	0,300	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,07	20
2	0,000	0,250	0,280	0,340	0,350	0,250	0,160	0,250	0,000	0,810	0,24	20
3	0,130	0,370	0,320	0,190	0,390	0,880	0,470	0,310	0,320	0,420	0,30	20
4	0,600	0,700	0,100	0,400	1,100	1,000	1,000 *	1,200	0,500	0,700	0,57	20
5	0,300	0,400	0,700	1,100	0,800	0,400	0,100	1,300	0,700	0,000	0,50	20
6	0,400	0,100	0,400	0,200	0,300	0,400	0,200	0,000	1,100	0,000	0,31	20
7	0,650	2,000 *	0,340	0,800	1,580	0,090	0,030	0,850	0,850	1,090	0,72	20
Sr	0,29	0,59	0,26	0,40	0,58	0,39	0,30	0,54	0,45	0,42		140
NE	14	14	14	14	14	14	14	14	14	14		
L	0,91	0,82	0,83	1,27	1,85	1,25	0,48	1,71	1,42	1,35		

Sr : repeatability standard deviation of each laboratory limit 0,54 mg/dl

NL : number of measurements per laboratory

L : Limit for difference between duplicates according Cochran test at 5% level.

SE : repeatability standard deviation per sample

NE : number of measurements per sample

*: discarded data using the test of Cochran at 5 %

** : missing data

r : limit of repeatability, absolute difference between two replicates=1,50 according ISO 14637 | IDF 195

Table III : Means of the replicates in mg / dl

Sample Lab Code	1	2	3	4	5	6	7	8	9	10
1	14,15	14,40 *	14,10 *	14,80 *	14,20 *	14,10 *	14,60 *	14,50 *	14,00 *	14,70 *
2	17,87	41,71	27,12	32,39	37,95	46,51	22,69	51,91	56,77	61,14
3	18,60	42,92	28,23	33,27	38,32	47,81	23,28	53,24	58,77	63,23
4	18,20	42,15	27,45	32,40	37,45	47,00	23,30	51,60	57,25	61,15
5	19,55	42,20	29,15	33,05	38,30	47,60	25,05	52,85	57,45	61,20
6	16,30	38,75 *	24,70	29,70	33,55 *	41,40 *	20,50	43,10 *	49,75 *	54,20 *
7	17,73	41,26	26,90	31,62	37,14	45,65	23,07	50,22	58,82	59,82
M	17,48	42,05	27,26	32,07	37,83	46,91	22,98	51,96	57,81	61,31
REF.	17,44	42,02	27,91	32,52	37,90	47,04	21,41	52,12	57,16	61,16
SD	1,77	0,62	1,50	1,30	0,52	0,87	1,46	1,18	0,93	1,22

M = mean per sample

REF. = reference values

SD = standard deviation per sample

*: discarded data using the test of Grubbs 5 %

REF : Assigned values are robust average values per sample according to algorithm A of standard ISO 13528, of 4 laboratories using the reference method ISO 14637 | IDF 195 or V 04-2017, after outliers discarding using Grubbs test 5% risk level

Table IV : Outlier identification

Sample	1	2	3	4	5	6	7	8	9	10
Outliers										
Cochran		7					4			
Outlier Grubbs		1, 6	1	1	1, 6	1, 6	1	1, 6	1, 6	1, 6
sr	0,29	0,33	0,28	0,43	0,68	0,45	0,17	0,63	0,40	0,50
SR	1,78	0,55	1,51	1,33	0,71	0,93	1,63	1,26	0,97	1,27

Table V : ACCURACY - differences (laboratory - reference) in mg / dl

Sample Lab code	1	2	3	4	5	6	7	8	9	10	d	Sd _{lab}	t
1	- 3,29	- 27,62	- 13,81	- 17,72	- 23,70	- 32,94	- 6,81	- 37,62	- 43,16	- 46,46	- 25,31	14,91	5,37
2	+ 0,43	- 0,31	- 0,79	- 0,13	+ 0,05	- 0,53	+ 1,28	- 0,21	- 0,39	- 0,03	- 0,06	0,58	0,35
3	+ 1,15	+ 0,90	+ 0,32	+ 0,74	+ 0,42	+ 0,78	+ 1,87	+ 1,12	+ 1,61	+ 2,07	+ 1,10	0,59	5,88
4	+ 0,76	+ 0,13	- 0,46	- 0,12	- 0,45	- 0,03	+ 1,89	- 0,52	+ 0,09	- 0,01	+ 0,13	0,72	0,56
5	+ 2,11	+ 0,18	+ 1,24	+ 0,53	+ 0,40	+ 0,56	+ 3,64	+ 0,73	+ 0,29	+ 0,04	+ 0,97	1,11	2,76
6	- 1,14	- 3,27	- 3,21	- 2,82	- 4,35	- 5,63	- 0,91	- 9,02	- 7,41	- 6,96	- 4,47	2,72	5,21
7	+ 0,28	- 0,76	- 1,01	- 0,90	- 0,76	- 1,39	+ 1,66	- 1,90	+ 1,66	- 1,35	- 0,45	1,24	1,14
d	+ 0,04	+ 0,03	- 0,65	- 0,45	- 0,07	- 0,12	+ 1,57	- 0,16	+ 0,65	+ 0,14	- 4,01	10,50	
Sd	1,77	0,62	1,50	1,30	0,52	0,87	1,46	1,18	0,93	1,22	1,20		

d = mean of differences Sd = standard deviation of differences t = Student test - comparison to 0

Upper limits : $\bar{d} = +/- 2,50 \text{ mg / dl}$ Sd = 1,50 mg / dl

ISO 14637 / IDF 195 : Precision of the method : Sr = 0.54 mg / dl
 SR = 1.81 mg / dl

Table VI : Zscore of the different laboratories for each sample. ZS calculated on the PT standard deviation

Sample Lab Code	1	2	3	4	5	6	7	8	9	10
1	-1,86	-44,75	-9,20	-13,66	-45,40	-37,67	-4,65	-31,81	-46,43	-37,97
2	+0,24	-0,51	-0,52	-0,10	+0,09	-0,61	+0,87	-0,18	-0,42	-0,02
3	+0,65	+1,45	+0,22	+0,57	+0,80	+0,89	+1,27	+0,94	+1,74	+1,69
4	+0,43	+0,21	-0,30	-0,10	-0,86	-0,04	+1,29	-0,44	+0,10	-0,01
5	+1,19	+0,29	+0,83	+0,41	+0,77	+0,65	+2,49	+0,62	+0,32	+0,03
6	-0,65	-5,30	-2,14	-2,18	-8,33	-6,44	-0,62	-7,63	-7,97	-5,69
7	+0,16	-1,23	-0,67	-0,70	-1,45	-1,59	+1,13	-1,61	+1,78	-1,10

In yellow the values bigger or smaller than 2/-2

In red the values bigger or smaller than 3/-3

Figure 2 : Zscore of the different laboratories for each sample. ZS calculated on the PT standard deviation

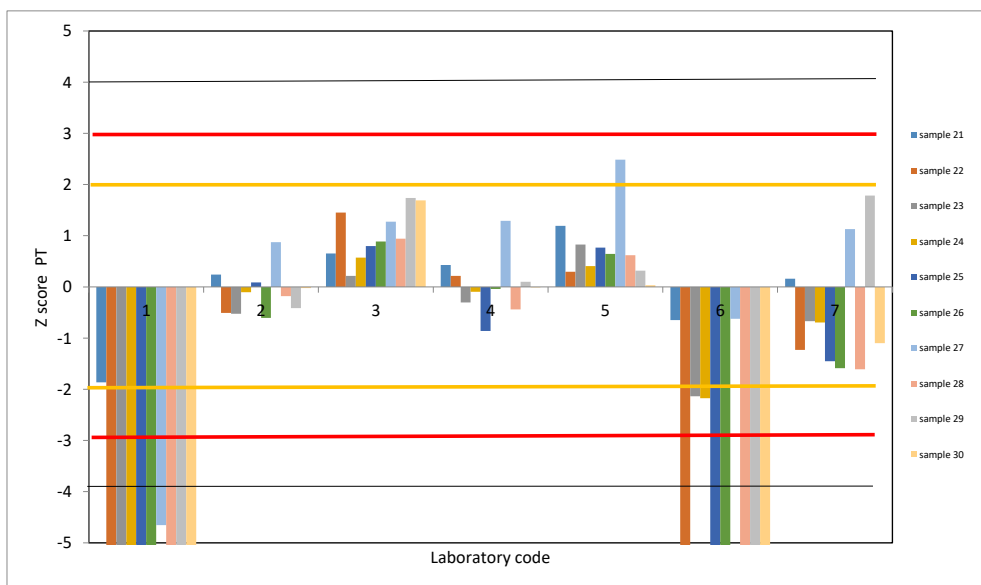


Table VII : Zscore of the different laboratories for each sample.
ZS calculated on the standard deviation of reproducibility of the method

Sample Lab Code	1	2	3	4	5	6	7	8	9	10
1	-1,82	-15,26	-7,63	-9,79	-13,09	-18,20	-3,76	-20,78	-23,84	-25,67
2	+0,24	-0,17	-0,43	-0,07	+0,03	-0,29	+0,71	-0,12	-0,21	-0,01
3	+0,64	+0,50	+0,18	+0,41	+0,23	+0,43	+1,03	+0,62	+0,89	+1,14
4	+0,42	+0,07	-0,25	-0,07	-0,25	-0,02	+1,04	-0,29	+0,05	-0,01
5	+1,16	+0,10	+0,69	+0,29	+0,22	+0,31	+2,01	+0,40	+0,16	+0,02
6	-0,63	-1,81	-1,77	-1,56	-2,40	-3,11	-0,50	-4,98	-4,09	-3,85
7	+0,16	-0,42	-0,56	-0,50	-0,42	-0,77	+0,91	-1,05	+0,92	-0,74

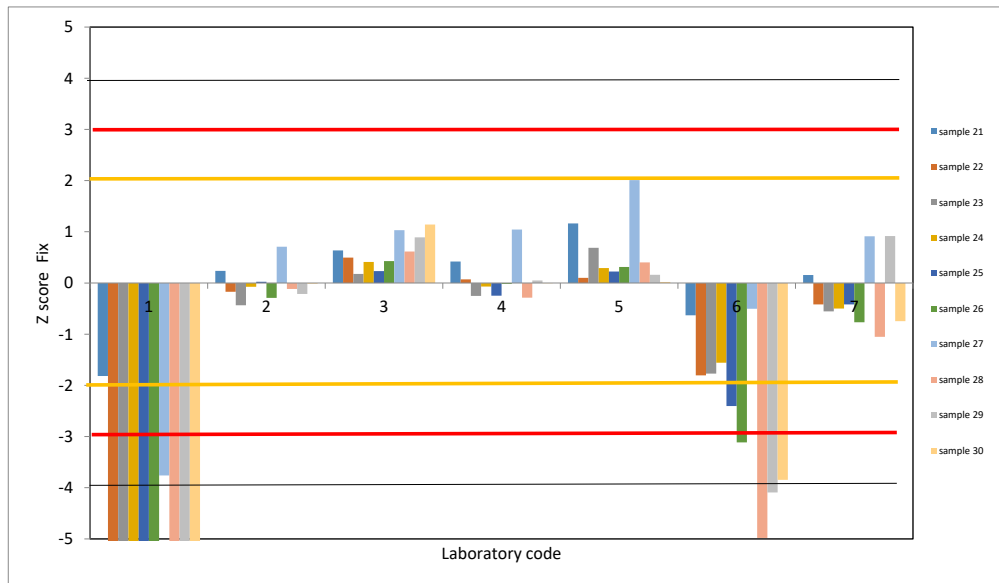
This table will allows to compare your ZSCORE from one PT to an other because the standard deviation has always the value of SR of the method SR=1,81

In yellow the values bigger or smaller than 2/-2

In red the values bigger or smaller than 3/-3

Figure 3 :

Zscore of the different laboratories for each sample. ZS calculated on the standard deviation of reproducibility of the method



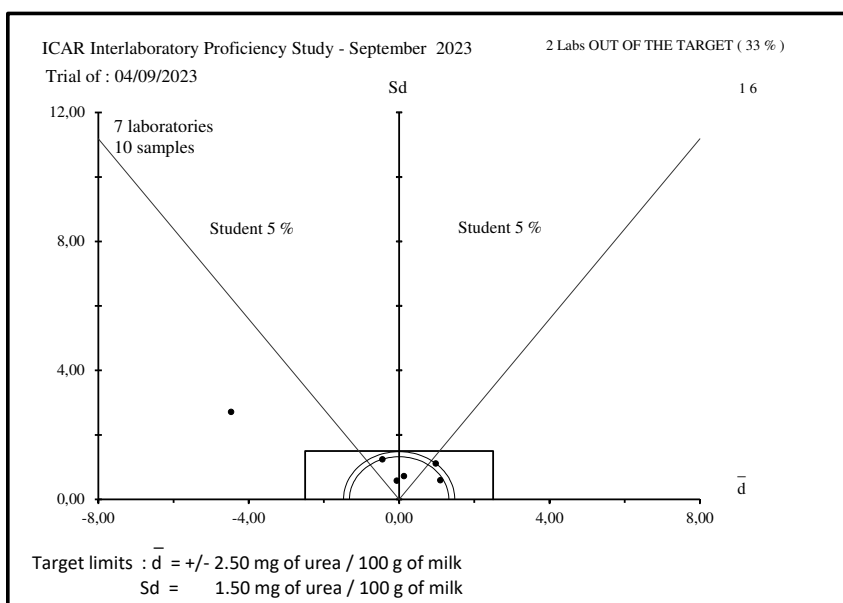


Figure 1 : ACCURACY - Evaluation of the individual performances (to see table I).

Table I : Ranking of the laboratories in %

Nb	%	N°	d	Sd	D	Method
1	2	27	- 1%	1%	1%	B
2	4	19	- 0%	2%	2%	B
3	5	36	- 0%	2%	2%	B
4	7	29	+ 1%	2%	2%	B
5	9	5	+ 0%	2%	2%	B
6	11	47	+ 1%	2%	2%	B
7	12	31	+ 1%	2%	2%	B
8	14	6	- 1%	2%	2%	B
9	16	51	+ 1%	2%	2%	C
10	18	8	- 2%	2%	3%	B
11	19	48	+ 1%	3%	3%	B
12	21	42	+ 1%	3%	3%	B
13	23	32	+ 2%	2%	3%	B
14	25	30	- 1%	3%	3%	B
15	26	15	+ 2%	2%	3%	B
16	28	52	+ 2%	2%	3%	B
17	30	21	+ 2%	2%	3%	B
18	32	34	- 1%	3%	3%	B
19	33	3	+ 2%	3%	3%	B
20	35	17	+ 1%	3%	3%	B
21	37	7	- 2%	3%	4%	B
22	39	28	+ 2%	3%	4%	B
23	40	22	+ 3%	2%	4%	B
24	42	26	+ 3%	3%	4%	B
25	44	10	- 3%	3%	4%	B
26	46	38	- 2%	3%	4%	B
27	47	24	+ 2%	3%	4%	B
28	49	44	+ 2%	4%	4%	B
29	51	16	+ 3%	3%	4%	B
30	53	25	+ 3%	3%	4%	B

Nb	%	N°	d	Sd	D	Method
31	54	18	- 4%	2%	5%	B
32	56	13	+ 3%	4%	5%	A
33	58	20	- 4%	3%	5%	B
34	60	9	- 5%	3%	6%	B
35	61	37	+ 4%	4%	6%	B
36	63	41	+ 4%	4%	6%	A
37	65	23	- 5%	4%	6%	C
38	67	33	+ 5%	4%	6%	B
39	68	11	- 5%	5%	7%	B
40	70	55	+ 5%	5%	7%	C
41	72	2	+ 5%	6%	8%	B
42	74	50	+ 7%	5%	8%	B
43	75	39	- 4%	7%	8%	B
44	77	4	- 8%	5%	9%	B
45	79	49	- 5%	8%	9%	B
46	81	56	+ 8%	7%	10%	C
47	82	35	+ 7%	9%	11%	B
48	84	14	- 4%	11%	12%	B
49	86	12	- 7%	10%	12%	B
50	88	43	- 8%	9%	12%	B
51	89	45	- 7%	12%	14%	B
52	91	1	- 2%	15%	16%	A
53	93	46	- 12%	17%	21%	A
54	95	53	- 13%	17%	21%	B
55	96	54	- 17%	18%	25%	B
56	98	57	+ 21%	17%	27%	C
57	100	40	- 26%	38%	46%	C

- A ISO 13366-1 | IDF 148-1
- B ISO 13366-2 | IDF 148-2
- C Image Cytometry

(NC : OUT of RANKING because of insufficient data number)
 (Nb : laboratory rank; % : relative rank)
 (N° : laboratory identification number)
 (d et Sd : mean and standard deviation of the differences (laboratory -reference))
 (D : Euclidian distance to YX-axis origin = SQUARE ROOT.(d² + Sd²))

The table should be studied in parallel with figure 1 where the laboratories are located according to an acceptability area (or target) the limits of which are :

$$\pm 10\% \text{ for } d \text{ and } 10\% \text{ for } Sd$$

REF : Assigned values are robust average values per sample according to algorithm A of standard ISO 13528, of 57 laboratories using reference method ISO 13366-1|IDF 148-1 and alternative method ISO 13366-2|IDF 148-2 after outlier discarding using Grubbs test at 5% risk level

Repeatability standard deviation of this ICAR proficiency test (after Cochran elimination at 5 %) S_{rPT} 14 2%
 Rep. Note : Limits are only indicative and so far do not constitute standard values; they indicate what is not S_{rPT} 47 8%
 reachable by labs for their self evaluation.

Table IIa : REPEATABILITY - Absolute difference between replicates in 10^3 cells / ml

Sample Lab code	1	2	3	4	5	6	7	8	9	10	Sr	NL
1	0	0	0	0	0	0	0	0	0	0	0	20
2	1	5	16	18	15	5	13	15	21	8	9	20
3	4	7	8	7	5	0	9	14	14	3	6	20
4	26	23 *	10	17	0	3	6	9	78	36	21	20
5	4	11	2	14	66 *	8	26	19	24	47	21	20
6	5	1	26	8	14	3	5	3	39	38	14	20
7	0	2	12	0	28	6	29	5	38	14	13	20
8	3	4	9	3	6	2	10	1	2	3	4	20
9	0	2	18	9	3	2	4	6	35	25	11	20
10	14	11	0	85	7	8	9	8	52	39	25	20
11	5	1	16	9	82 *	1	10	3	10	7	19	20
12	2	6	36	80	25	0	5	1	15	44	23	20
13	8	6	20	83	14	2	13	20	60	17	25	20
14	27	14	32	48	23	1	4	1	12	26	17	20
15	15	12	13	7	21	8	27	7	6	19	11	20
16	11	13	9	17	20	0	4	16	14	43	13	20
17	24	11	1	45	29	5	21	2	29	39	18	20
18	10	3	1	2	14	3	5	7	1	24	7	20
19	16	6	16	46	16	4	10	16	8	42	16	20
20	1	11	9	52	6	7	6	21	16	44	17	20
21	23	5	20	49	1	3	10	5	19	5	14	20
22	4	4	4	18	4	5	2	7	6	12	6	20
23	4	1	5	18	13	1	1	1	6	10	6	20
24	2	17	8	52	51	2	3	5	25	26	19	20
25	7	5	9	12	1	0	10	11	37	7	10	20
26	3	1	8	18	4	6	1	2	5	8	5	20
27	6	0	1	0	4	2	11	15	0	12	5	20
28	1	2	6	5	3	2	9	16	22	6	7	20
29	19	5	2	27	37	2	13	13	50	5	16	20
30	6	9	0	10	15	1	0	26	0	44	12	20

Table II : REPEATABILITY - Absolute difference between replicates in 10^3 cells / ml

Sample Lab code	1	2	3	4	5	6	7	8	9	10	Sr	NL
31	10	9	18	20	21	0	22	13	3	84	21	20
32	2	2	2	5	24	2	7	0	10	15	7	20
33	1	0	11	12	3	2	3	2	0	13	5	20
34	2	1	3	4	5	1	1	3	4	2	2	20
35	34	43 *	5	7	7	6	23	6	38	19	17	20
36	1	1	8	8	1	3	15	17	32	27	11	20
37	2	1	4	4	13	2	6	3	7	14	5	20
38	0	1	15	3	18	2	3	5	5	20	7	20
39	11	4	18	11	14	5	0	10	5	10	7	20
40	15	9	57 *	50	29	2	11	55 *	23	14	23	20
41	14	9	19	76	28	1	41	23	60	9	26	20
42	14	3	4	42	13	1	16	4	1	26	12	20
43	16	6	1	15	30	0	15	19	22	41	14	20
44	19	5	4	8	21	11	2	5	36	47	15	20
45	23	1	44	76	42	10	24	30	64	23	28	20
46	1	2	3	2	1	1	15	1	19	1	6	20
47	4	5	19	67	14	0	19	8	23	24	18	20
48	24	4	19	29	9	8	21	10	25	43	16	20
49	0	0	12	31	15	0	6	5	43	10	13	20
50	1	0	4	16	12	12	4	4	0	1	5	20
51	1	1	4	9	12	4	8	2	8	1	4	20
52	1	0	7	3	3	0	7	0	9	2	3	20
53	3	12	21	41	5	14	11	23	34	15	15	20
54	2	4	2	48	86 *	1	20	32	0	23	24	20
55	4	5	12	25	19	1	7	0	29	26	12	20
56	9	1	9	4	13	5	4	10	15	8	6	20
57	24	1	3	39	2	13	3	13	42	60	20	20
Sr	9	6	11	24	18	4	9	10	20	20		1140
r	42	25	63	126	126	25	42	50	126	126		
NE	114	114	114	114	114	114	114	114	114	114		
L	39	20	44	109	56	16	42	39	89	88		

Sr : repeatability standard deviation of each laboratory limit : Cf up down

NL : number of measurements per laboratory

L : Limit for difference between duplicates according Cochran test at 5% level.

SE : repeatability standard deviation per sample

NE : number of measurements per sample

*: discarded data using the test of Cochran at 5 %

** : missing data

r : limit of repeatability, absolute difference between two replicates according ISO 13366-2 / IDF 148-2 : Cf up down

Level 10^3 / ml	Sr %	r
150	6	25
200	5	42
450	4	50
750	3	63
1500	3	126

Table III : Means of the replicates in 10³ cells / ml

Sample Lab code	1	2	3	4	5	6	7	8	9	10	#
1	150 *	80	580	1700	750	59	310	380	1300	870	*
2	195	88	615	1609	822	36	294	457	1359	1142	
3	195	90	586	1577	778	50	294	438	1296	1085	
4	157	78	516	1407	737	37	250	372	1208	1051	
5	190	98	588	1546	775	42	293	434	1266	1066	
6	188	95	581	1513	788	48	287	431	1262	1045	
7	186	90	561	1529	756	45	283	428	1233	1043	
8	184	94	580	1487	758	44	278	434	1253	1060	
9	177	87	543	1457	749	43	267	409	1225	1044	
10	193	93	570	1473	765	49	285	417	1234	1049	
11	178	89	548	1429	773	49	272	409	1215	1029	
12	175	89	557	1311	737	43	283	412	1222	1009	
13	196	97	591	1591	805	42	298	432	1285	1132	
14	189	89	543	1297	771	41	292	428	1293	1080	
15	198	103	597	1547	795	57	294	440	1310	1105	
16	195	104	601	1572	809	49	299	449	1319	1115	
17	193	109	573	1536	774	47	286	424	1331	1073	
18	164	71	559	1513	763	30	261	403	1228	1034	
19	193	95	573	1537	770	41	280	420	1280	1075	
20	184	93	553	1471	727	49	265	396	1231	1051	
21	182	98	574	1549	805	52	291	452	1303	1102	
22	195	107	594	1551	792	46	293	447	1321	1114	
23	176	78	575	1441	759	26 *	267	419	1208	1043	
24	194	105	593	1545	803	36	288	431	1338	1078	
25	193	94	598	1580	805	40	289	445	1307	1123	
26	195	95	607	1564	809	43	296	439	1310	1103	
27	187	92	579	1500	773	42	288	434	1265	1067	
28	201	97	601	1557	805	41	284	442	1319	1096	
29	196	100	579	1540	799	44	294	427	1284	1068	
30	188	93	596	1501	759	43	277	441	1286	1044	

M = mean per sample

REF. = reference values

SD = standard deviation per sample

*: discarded data using the test of Grubbs 5 %

REF : Assigned values are robust average values per sample according to algorithm A of standard ISO 13528, of 57 laboratories using the reference method ISO 13366 | IDF 148-1 and alternative method ISO 13366-2 | IDF 148-2, after outlier discarding using Grubbs test at 5% risk level

Table IV : Outlier identification

Sample	31	32	33	34	35	36	37	38	39	40	#
Outliers Cochran		4, 35	40		5, 11 54			40			
Outlier Grubbs	1, 44		40, 43 54, 57	40	40, 46 54, 57	23	57	40, 57	40, 54 57	1, 46, 53 54, 57	
sr	9	5	10	24	13	4	10	9	20	19	
SR	12	9	25	113	28	6	15	25	73	40	
sr %	5%	5%	2%	2%	2%	8%	3%	2%	2%	2%	
SR %	7%	9%	4%	7%	4%	13%	5%	6%	6%	4%	

Table III : Means of the replicates in 10³ cells / ml

	1	2	3	4	5	6	7	8	9	10
31	188	93	581	1509	780	40	293	444	1289	1119
32	194	93	601	1553	803	43	300	451	1290	1098
33	197	96	616	1611	812	46	317	449	1308	1124
34	196	106	581	1511	751	47	284	438	1226	1066
35	204	94	595	1530	825	37	314	500	1456	1151
36	188	89	594	1542	775	45	290	419	1264	1074
37	187	103	605	1602	785	44	301	450	1308	1131
38	192	93	584	1465	777	43	280	436	1230	1055
39	191	93	586	1373	770	43	284	440	1219	1051
40	186	109	403 *	846 *	617 *	58	271	319 *	754 *	1088
41	200	98	607	1599	824	43	289	448	1322	1103
42	184	94	595	1561	776	40	287	433	1262	1107
43	179	92	481 *	1435	734	42	274	410	1090	1049
44	251 *	115	622	1498	802	46	290	440	1255	1089
45	186	96	540	1306	766	41	300	393	1132	1099
46	191	105	567	1256	667 *	49	324	420	1074	894 *
47	191	93	589	1523	792	39	295	437	1269	1120
48	187	93	575	1531	818	45	280	434	1306	1092
49	197	99	563	1402	759	44	296	441	1148	1053
50	210	105	637	1605	834	46	301	465	1361	1138
51	184	86	596	1550	781	43	295	443	1294	1093
52	194	97	586	1565	796	42	289	439	1299	1094
53	183	91	562	1216	743	43	277	376	1046	948 *
54	164	93	485 *	1199	676 *	52	267	376	987 *	915 *
55	206	95	635	1599	803	46	304	468	1297	1165
56	208	98	631	1645	820	45	304	468	1359	1190
57	218	109	710 *	1812	942 *	48	353 *	527 *	1553 *	1318 *
M	190	95	584	1507	782	44	288	431	1266	1086
REF.	190	95	584	1518	782	44	288	432	1273	1085
SD	11	8	24	112	26	5	14	24	72	38
AVT	187	90	590	1466	770	37	283	435	1211	1003

M = mean per sample

REF. = reference values

SD = standard deviation per sample

*: discarded data using the test of Grubbs 5 %

AVT = Assign value traceable to the ERM BD001

REF : Assigned values are robust average values per sample according to algorithm A of standard ISO 13528, of 57 laboratories using the reference method ISO 13366 | IDF 148-1 and alternative method ISO 13366-2 | IDF 148-2, after outlier discarding using Grubbs test at 5% risk level

Table IV : Outlier identification

Sample	1	2	3	4	5	6	7	8	9	10	#
Outliers Cochran		4, 35	40		5, 11 54			40			
Outlier Grubbs	1, 44		40,43 54,57	40	40,46 54,57	23	57	40, 57	40,54 57	1,46,53 54,57	
sr	9	5	10	24	13	4	10	9	20	19	
SR	12	9	25	113	28	6	15	25	73	40	
sr %	5%	5%	2%	2%	2%	8%	3%	2%	2%	2%	
SR %	7%	9%	4%	7%	4%	13%	5%	6%	6%	4%	
SR Method for AVT values	14	8	39	88	45	3	23	31	73	60	

Table V : ACCURACY - differences (laboratory - reference) in %

Sample Lab code	1	2	3	4	5	6	7	8	9	10	d	Sd _{lab}	t
1	- 21%	- 16%	- 1%	+ 12%	- 4%	+ 34%	+ 8%	- 12%	+ 2%	- 20%	- 2%	15%	0,36
2	+ 2%	- 8%	+ 5%	+ 6%	+ 5%	- 19%	+ 2%	+ 6%	+ 7%	+ 5%	+ 5%	6%	2,82
3	+ 3%	- 6%	+ 0%	+ 4%	- 1%	+ 14%	+ 2%	+ 1%	+ 2%	- 0%	+ 2%	3%	1,60
4	- 17%	- 18%	- 12%	- 7%	- 6%	- 17%	- 13%	- 14%	- 5%	- 3%	- 8%	5%	5,10
5	+ 0%	+ 3%	+ 1%	+ 2%	- 1%	- 5%	+ 2%	+ 0%	- 1%	- 2%	+ 0%	2%	0,17
6	- 1%	- 1%	- 1%	- 0%	+ 1%	+ 8%	- 1%	- 0%	- 1%	- 4%	- 1%	2%	1,35
7	- 2%	- 5%	- 4%	+ 1%	- 3%	+ 2%	- 2%	- 1%	- 3%	- 4%	- 2%	3%	2,43
8	- 3%	- 1%	- 1%	- 2%	- 3%	- 0%	- 3%	+ 0%	- 2%	- 2%	- 2%	2%	3,21
9	- 7%	- 8%	- 7%	- 4%	- 4%	- 2%	- 7%	- 5%	- 4%	- 4%	- 5%	3%	4,81
10	+ 2%	- 3%	- 2%	- 3%	- 2%	+ 11%	- 1%	- 3%	- 3%	- 3%	- 3%	3%	2,89
11	- 7%	- 7%	- 6%	- 6%	- 1%	+ 10%	- 6%	- 5%	- 5%	- 5%	- 5%	5%	3,26
12	- 8%	- 6%	- 5%	- 14%	- 6%	- 2%	- 2%	- 5%	- 4%	- 7%	- 7%	10%	2,34
13	+ 3%	+ 2%	+ 1%	+ 5%	+ 3%	- 5%	+ 3%	- 0%	+ 1%	+ 4%	+ 3%	4%	2,33
14	- 1%	- 6%	- 7%	- 15%	- 1%	- 8%	+ 1%	- 1%	+ 2%	- 0%	- 4%	11%	1,22
15	+ 4%	+ 8%	+ 2%	+ 2%	+ 2%	+ 29%	+ 2%	+ 2%	+ 3%	+ 2%	+ 2%	2%	4,63
16	+ 2%	+ 9%	+ 3%	+ 4%	+ 3%	+ 11%	+ 4%	+ 4%	+ 4%	+ 3%	+ 3%	3%	4,05
17	+ 2%	+ 14%	- 2%	+ 1%	- 1%	+ 6%	- 1%	- 2%	+ 5%	- 1%	+ 1%	3%	0,78
18	- 14%	- 26%	- 4%	- 0%	- 2%	- 33%	- 10%	- 7%	- 4%	- 5%	- 4%	2%	6,26
19	+ 2%	- 0%	- 2%	+ 1%	- 2%	- 7%	- 3%	- 3%	+ 1%	- 1%	- 0%	2%	0,81
20	- 3%	- 3%	- 5%	- 3%	- 7%	+ 10%	- 8%	- 8%	- 3%	- 3%	- 4%	3%	4,34
21	- 4%	+ 3%	- 2%	+ 2%	+ 3%	+ 17%	+ 1%	+ 5%	+ 2%	+ 2%	+ 2%	2%	2,44
22	+ 3%	+ 13%	+ 2%	+ 2%	+ 1%	+ 3%	+ 2%	+ 3%	+ 4%	+ 3%	+ 3%	2%	3,54
23	- 7%	- 18%	- 2%	- 5%	- 3%	- 42%	- 7%	- 3%	- 5%	- 4%	- 5%	4%	4,09
24	+ 2%	+ 10%	+ 2%	+ 2%	+ 3%	- 18%	- 0%	- 0%	+ 5%	- 1%	+ 2%	3%	1,72
25	+ 1%	- 2%	+ 2%	+ 4%	+ 3%	- 9%	+ 0%	+ 3%	+ 3%	+ 3%	+ 3%	3%	2,68
26	+ 2%	- 1%	+ 4%	+ 3%	+ 3%	- 2%	+ 3%	+ 2%	+ 3%	+ 2%	+ 3%	3%	3,29
27	- 2%	- 3%	- 1%	- 1%	- 1%	- 5%	- 0%	+ 0%	- 1%	- 2%	- 1%	1%	3,07
28	+ 6%	+ 2%	+ 3%	+ 3%	+ 3%	- 7%	- 2%	+ 2%	+ 4%	+ 1%	+ 2%	3%	2,84
29	+ 3%	+ 5%	- 1%	+ 1%	+ 2%	- 0%	+ 2%	- 1%	+ 1%	- 2%	+ 1%	2%	1,04
30	- 1%	- 3%	+ 2%	- 1%	- 3%	- 3%	- 4%	+ 2%	+ 1%	- 4%	- 1%	3%	1,18

d = mean of differences Sd = standard deviation of differences t = Student test - comparison to 0

Upper limits : $\bar{d} = +/- 10\%$ Sd = 10%

ISO 13366-2|IDF 148-2 : Precision of the method :

Level SCC *10 ² /ml	Sr %	r	SR %	R
150	6	25	9	38
200	5	42	8	67
450	4	50	7	88
750	3	63	6	126
1500	3	126	6	252

Table V : ACCURACY - differences (laboratory - reference) in %

Sample Lab code	1	2	3	4	5	6	7	8	9	10	d	Sd _{lab}	t
31	- 1%	- 3%	- 1%	- 1%	- 0%	- 9%	+ 2%	+ 3%	+ 1%	+ 3%	+ 1%	2%	1,07
32	+ 2%	- 2%	+ 3%	+ 2%	+ 3%	- 2%	+ 4%	+ 4%	+ 1%	+ 1%	+ 2%	2%	3,81
33	+ 3%	+ 1%	+ 5%	+ 6%	+ 4%	+ 4%	+ 10%	+ 4%	+ 3%	+ 4%	+ 5%	4%	3,35
34	+ 3%	+ 11%	- 1%	- 0%	- 4%	+ 6%	- 2%	+ 1%	- 4%	- 2%	- 1%	3%	1,50
35	+ 7%	- 2%	+ 2%	+ 1%	+ 5%	- 16%	+ 9%	+ 16%	+ 14%	+ 6%	+ 7%	9%	2,32
36	- 1%	- 7%	+ 2%	+ 2%	- 1%	+ 1%	+ 0%	- 3%	- 1%	- 1%	- 0%	2%	0,38
37	- 2%	+ 8%	+ 4%	+ 6%	+ 0%	- 0%	+ 4%	+ 4%	+ 3%	+ 4%	+ 4%	4%	2,65
38	+ 1%	- 3%	- 0%	- 3%	- 1%	- 2%	- 3%	+ 1%	- 3%	- 3%	- 2%	3%	2,13
39	+ 0%	- 2%	+ 0%	- 10%	- 2%	- 3%	- 1%	+ 2%	- 4%	- 3%	- 4%	7%	1,64
40	- 2%	+ 14%	- 31%	- 44%	- 21%	+ 32%	- 6%	- 26%	- 41%	+ 0%	- 26%	38%	2,15
41	+ 5%	+ 3%	+ 4%	+ 5%	+ 5%	- 3%	+ 0%	+ 4%	+ 4%	+ 2%	+ 4%	4%	2,88
42	- 3%	- 2%	+ 2%	+ 3%	- 1%	- 10%	- 0%	+ 0%	- 1%	+ 2%	+ 1%	3%	0,89
43	- 6%	- 3%	- 18%	- 5%	- 6%	- 5%	- 5%	- 5%	- 14%	- 3%	- 8%	9%	2,78
44	+ 32%	+ 21%	+ 6%	- 1%	+ 3%	+ 3%	+ 1%	+ 2%	- 1%	+ 0%	+ 2%	4%	1,49
45	- 2%	+ 1%	- 8%	- 14%	- 2%	- 7%	+ 4%	- 9%	- 11%	+ 1%	- 7%	12%	1,84
46	+ 0%	+ 11%	- 3%	- 17%	- 15%	+ 10%	+ 12%	- 3%	- 16%	- 18%	- 12%	17%	2,20
47	+ 1%	- 3%	+ 1%	+ 0%	+ 1%	- 11%	+ 2%	+ 1%	- 0%	+ 3%	+ 1%	2%	1,51
48	- 2%	- 2%	- 2%	+ 1%	+ 5%	+ 2%	- 3%	+ 0%	+ 3%	+ 1%	+ 1%	3%	1,35
49	+ 4%	+ 4%	- 4%	- 8%	- 3%	- 0%	+ 3%	+ 2%	- 10%	- 3%	- 5%	8%	1,82
50	+ 10%	+ 11%	+ 9%	+ 6%	+ 7%	+ 4%	+ 4%	+ 8%	+ 7%	+ 5%	+ 7%	5%	4,21
51	- 3%	- 10%	+ 2%	+ 2%	- 0%	- 2%	+ 2%	+ 3%	+ 2%	+ 1%	+ 1%	2%	1,82
52	+ 2%	+ 2%	+ 0%	+ 3%	+ 2%	- 5%	+ 0%	+ 2%	+ 2%	+ 1%	+ 2%	2%	2,27
53	- 4%	- 4%	- 4%	- 20%	- 5%	- 2%	- 4%	- 13%	- 18%	- 13%	- 13%	17%	2,41
54	- 14%	- 2%	- 17%	- 21%	- 14%	+ 17%	- 7%	- 13%	- 22%	- 16%	- 17%	18%	2,93
55	+ 8%	- 1%	+ 9%	+ 5%	+ 3%	+ 3%	+ 5%	+ 8%	+ 2%	+ 7%	+ 5%	5%	3,49
56	+ 9%	+ 3%	+ 8%	+ 8%	+ 5%	+ 1%	+ 6%	+ 8%	+ 7%	+ 10%	+ 8%	7%	3,40
57	+ 15%	+ 14%	+ 21%	+ 19%	+ 20%	+ 8%	+ 22%	+ 22%	+ 22%	+ 21%	+ 21%	17%	3,77
d	- 0%	- 0%	- 0%	- 1%	- 0%	+ 0%	- 0%	- 0%	- 1%	+ 0%	- 1%	8%	
Sd	6%	9%	4%	7%	3%	12%	5%	6%	6%	3%			

d = mean of differences Sd = standard deviation of differences t = Student test - comparison to 0

Upper limits : d = +/- 10% Sd = 10%

ISO 13366-2|IDF 148-2 : Precision of the method :

Level SCC *10 ² /ml	Sr %	r	SR %	R
150	6	25	9	38
200	5	42	8	67
450	4	50	7	88
750	3	63	6	126
1500	3	126	6	252

Table VI : Zscore of the different laboratories for each sample. ZS calculated on the PT standard deviation

Sample code	1	2	3	4	5	6	7	8	9	10
1	-3,71	-1,85	-0,17	+1,63	-1,20	+2,86	+1,59	-2,16	+0,38	-5,71
2	+0,42	-0,92	+1,27	+0,82	+1,51	-1,63	+0,39	+1,01	+1,19	+1,53
3	+0,47	-0,68	+0,08	+0,53	-0,16	+1,14	+0,39	+0,25	+0,32	-0,00
4	-3,06	-2,16	-2,80	-1,00	-1,70	-1,44	-2,75	-2,51	-0,90	-0,90
5	+0,00	+0,31	+0,16	+0,25	-0,26	-0,39	+0,36	+0,06	-0,10	-0,51
6	-0,23	-0,06	-0,13	-0,04	+0,24	+0,66	-0,11	-0,06	-0,16	-1,05
7	-0,37	-0,62	-0,95	+0,10	-0,98	+0,19	-0,40	-0,19	-0,55	-1,11
8	-0,60	-0,12	-0,19	-0,28	-0,90	-0,01	-0,73	+0,06	-0,28	-0,67
9	-1,20	-0,99	-1,69	-0,55	-1,26	-0,20	-1,52	-0,95	-0,67	-1,09
10	+0,28	-0,31	-0,58	-0,40	-0,65	+0,95	-0,26	-0,62	-0,54	-0,96
11	-1,16	-0,80	-1,48	-0,80	-0,33	+0,85	-1,16	-0,98	-0,80	-1,49
12	-1,39	-0,74	-1,11	-1,85	-1,72	-0,20	-0,40	-0,85	-0,71	-2,01
13	+0,56	+0,25	+0,28	+0,65	+0,88	-0,39	+0,68	-0,00	+0,17	+1,25
14	-0,14	-0,74	-1,69	-1,98	-0,43	-0,68	+0,28	-0,19	+0,28	-0,12
15	+0,70	+0,98	+0,51	+0,26	+0,48	+2,48	+0,39	+0,31	+0,52	+0,53
16	+0,42	+1,05	+0,67	+0,48	+1,03	+0,95	+0,79	+0,70	+0,64	+0,79
17	+0,28	+1,66	-0,48	+0,16	-0,31	+0,47	-0,19	-0,33	+0,80	-0,32
18	-2,41	-3,02	-1,05	-0,04	-0,71	-2,78	-1,99	-1,22	-0,63	-1,35
19	+0,28	-0,00	-0,46	+0,17	-0,45	-0,58	-0,58	-0,50	+0,10	-0,26
20	-0,60	-0,31	-1,30	-0,42	-2,08	+0,85	-1,67	-1,51	-0,58	-0,90
21	-0,79	+0,31	-0,42	+0,28	+0,86	+1,43	+0,21	+0,81	+0,41	+0,45
22	+0,47	+1,48	+0,41	+0,30	+0,39	+0,28	+0,36	+0,60	+0,67	+0,78
23	-1,30	-2,16	-0,39	-0,69	-0,88	-3,55	-1,56	-0,56	-0,90	-1,11
24	+0,37	+1,17	+0,37	+0,25	+0,79	-1,54	-0,04	-0,06	+0,90	-0,18
25	+0,23	-0,19	+0,55	+0,56	+0,86	-0,77	+0,07	+0,52	+0,47	+1,01
26	+0,42	-0,06	+0,94	+0,42	+1,03	-0,20	+0,54	+0,29	+0,51	+0,49
27	-0,28	-0,37	-0,23	-0,16	-0,33	-0,39	-0,04	+0,06	-0,11	-0,47
28	+0,98	+0,25	+0,70	+0,35	+0,86	-0,58	-0,33	+0,41	+0,64	+0,30
29	+0,51	+0,55	-0,21	+0,20	+0,63	-0,01	+0,39	-0,23	+0,15	-0,46
30	-0,18	-0,31	+0,49	-0,15	-0,88	-0,29	-0,80	+0,37	+0,18	-1,08

In yellow the values bigger or smaller than 2/-2

In red the values bigger or smaller than 3/-3

Figure 2 :

Zscore of the different laboratories for each sample. ZS calculated on the PT standard deviation

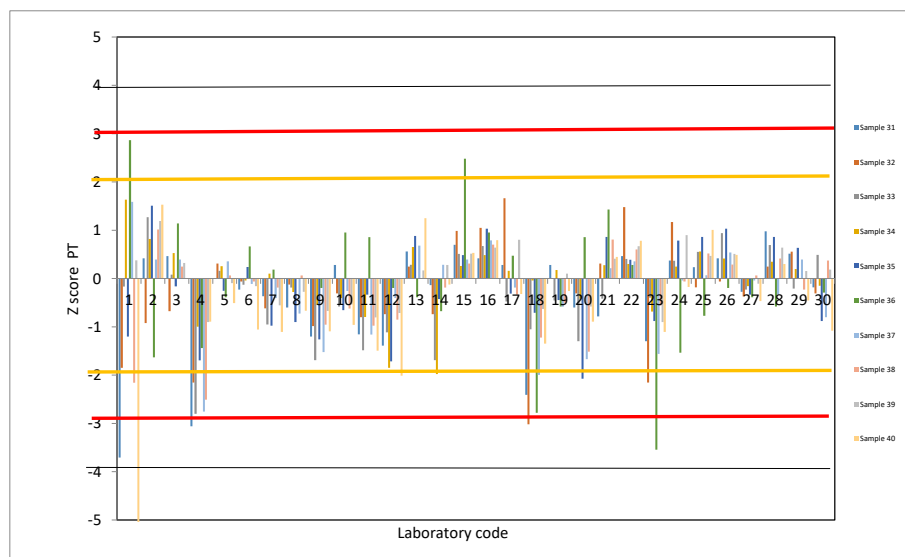


Table VI : Zscore of the different laboratories for each sample. ZS calculated on the PT standard deviation

Sample code	1	2	3	4	5	6	7	8	9	10
31	-0,18	-0,31	-0,13	-0,08	-0,09	-0,77	+0,36	+0,48	+0,22	+0,91
32	+0,37	-0,25	+0,70	+0,31	+0,81	-0,20	+0,83	+0,79	+0,24	+0,34
33	+0,61	+0,12	+1,29	+0,84	+1,13	+0,38	+2,06	+0,70	+0,49	+1,03
34	+0,56	+1,29	-0,15	-0,06	-1,19	+0,47	-0,33	+0,23	-0,65	-0,50
35	+1,30	-0,19	+0,43	+0,11	+1,62	-1,35	+1,84	+2,82	+2,54	+1,75
36	-0,23	-0,80	+0,41	+0,22	-0,28	+0,09	+0,10	-0,56	-0,12	-0,30
37	-0,28	+0,92	+0,86	+0,76	+0,10	-0,01	+0,94	+0,72	+0,48	+1,23
38	+0,19	-0,31	-0,02	-0,48	-0,18	-0,20	-0,62	+0,14	-0,60	-0,79
39	+0,05	-0,25	+0,08	-1,30	-0,45	-0,29	-0,29	+0,33	-0,76	-0,90
40	-0,42	+1,66	-7,47	-6,02	-6,26	+2,67	-1,27	-4,71	-7,21	+0,09
41	+0,93	+0,31	+0,92	+0,73	+1,60	-0,29	+0,03	+0,64	+0,68	+0,48
42	-0,55	-0,19	+0,45	+0,39	-0,24	-0,87	-0,08	+0,04	-0,16	+0,60
43	-1,02	-0,37	-4,26	-0,74	-1,81	-0,39	-1,05	-0,93	-2,54	-0,96
44	+5,61	+2,40	+1,56	-0,18	+0,75	+0,28	+0,14	+0,31	-0,25	+0,10
45	-0,42	+0,06	-1,81	-1,90	-0,60	-0,58	+0,86	-1,62	-1,96	+0,37
46	+0,05	+1,23	-0,72	-2,34	-4,37	+0,85	+2,56	-0,52	-2,77	-5,09
47	+0,09	-0,31	+0,18	+0,04	+0,39	-0,96	+0,47	+0,21	-0,06	+0,94
48	-0,28	-0,25	-0,39	+0,12	+1,35	+0,19	-0,62	+0,08	+0,45	+0,18
49	+0,65	+0,49	-0,87	-1,04	-0,88	-0,01	+0,57	+0,35	-1,74	-0,84
50	+1,81	+1,23	+2,18	+0,78	+1,98	+0,38	+0,94	+1,37	+1,22	+1,41
51	-0,60	-1,17	+0,49	+0,29	-0,03	-0,20	+0,50	+0,46	+0,29	+0,21
52	+0,33	+0,25	+0,06	+0,42	+0,52	-0,39	+0,03	+0,29	+0,36	+0,25
53	-0,69	-0,49	-0,93	-2,71	-1,49	-0,20	-0,84	-2,34	-3,15	-3,65
54	-2,41	-0,25	-4,07	-2,85	-4,01	+1,43	-1,52	-2,32	-3,97	-4,53
55	+1,49	-0,06	+2,09	+0,72	+0,79	+0,28	+1,12	+1,49	+0,33	+2,14
56	+1,63	+0,31	+1,91	+1,14	+1,43	+0,09	+1,15	+1,49	+1,19	+2,80
57	+2,60	+1,66	+5,16	+2,63	+6,07	+0,66	+4,66	+3,92	+3,89	+6,21

In yellow the values bigger or smaller than 2/-2

In red the values bigger or smaller than 3/-3

Figure 2 : Zscore of the different laboratories for each sample. ZS calculated on the PT standard deviation

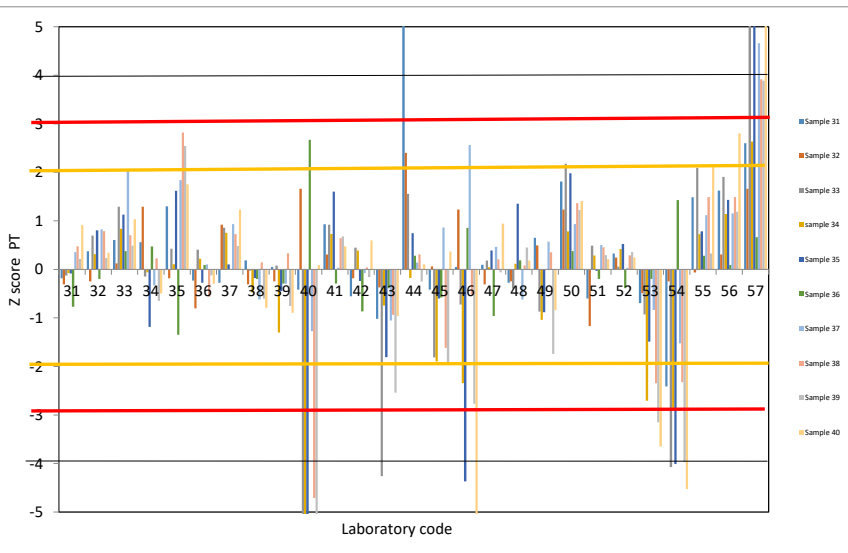


Table VII : Zscore of the different laboratories for each sample.
ZS calculated on AVT and standard deviation of reproducibility of the method

Sample Lab code	1	2	3	4	5	6	7	8	9	10
1	-2,53	-1,23	-0,26	+2,66	-0,44	+6,82	+1,17	-1,78	+1,23	-2,21
2	+0,56	-0,31	+0,65	+1,63	+1,14	-0,30	+0,46	+0,70	+2,04	+2,31
3	+0,59	-0,06	-0,10	+1,26	+0,17	+4,09	+0,46	+0,10	+1,18	+1,35
4	-2,05	-1,54	-1,92	-0,68	-0,73	+0,00	-1,43	-2,06	-0,03	+0,80
5	+0,24	+0,93	-0,05	+0,91	+0,11	+1,67	+0,43	-0,05	+0,76	+1,04
6	+0,07	+0,56	-0,23	+0,53	+0,40	+3,33	+0,15	-0,15	+0,70	+0,70
7	-0,03	+0,00	-0,75	+0,72	-0,31	+2,58	-0,02	-0,24	+0,31	+0,66
8	-0,21	+0,49	-0,27	+0,23	-0,27	+2,27	-0,22	-0,05	+0,58	+0,94
9	-0,66	-0,37	-1,22	-0,11	-0,48	+1,97	-0,70	-0,84	+0,19	+0,67
10	+0,45	+0,31	-0,52	+0,07	-0,12	+3,79	+0,07	-0,58	+0,32	+0,76
11	-0,63	-0,19	-1,09	-0,43	+0,07	+3,64	-0,48	-0,86	+0,06	+0,42
12	-0,80	-0,12	-0,86	-1,76	-0,74	+1,97	-0,02	-0,76	+0,15	+0,10
13	+0,66	+0,86	+0,03	+1,41	+0,78	+1,67	+0,63	-0,10	+1,02	+2,13
14	+0,14	-0,12	-1,22	-1,92	+0,01	+1,21	+0,39	-0,24	+1,13	+1,28
15	+0,76	+1,60	+0,17	+0,91	+0,54	+6,21	+0,46	+0,15	+1,37	+1,69
16	+0,56	+1,67	+0,27	+1,20	+0,87	+3,79	+0,70	+0,45	+1,49	+1,85
17	+0,45	+2,28	-0,45	+0,79	+0,08	+3,03	+0,11	-0,36	+1,65	+1,15
18	-1,56	-2,41	-0,82	+0,53	-0,16	-2,12	-0,98	-1,05	+0,23	+0,51
19	+0,45	+0,62	-0,44	+0,81	+0,00	+1,36	-0,13	-0,49	+0,96	+1,20
20	-0,21	+0,31	-0,97	+0,06	-0,96	+3,64	-0,78	-1,28	+0,28	+0,80
21	-0,35	+0,93	-0,42	+0,94	+0,77	+4,55	+0,35	+0,53	+1,27	+1,64
22	+0,59	+2,10	+0,10	+0,97	+0,49	+2,73	+0,43	+0,37	+1,52	+1,84
23	-0,73	-1,54	-0,40	-0,28	-0,26	-3,33	-0,72	-0,53	-0,03	+0,66
24	+0,52	+1,79	+0,08	+0,90	+0,72	-0,15	+0,20	-0,15	+1,75	+1,25
25	+0,42	+0,43	+0,19	+1,30	+0,77	+1,06	+0,26	+0,31	+1,32	+1,99
26	+0,56	+0,56	+0,44	+1,11	+0,87	+1,97	+0,54	+0,13	+1,36	+1,66
27	+0,03	+0,25	-0,30	+0,39	+0,07	+1,67	+0,20	-0,05	+0,75	+1,06
28	+0,97	+0,86	+0,29	+1,03	+0,77	+1,36	+0,02	+0,23	+1,49	+1,54
29	+0,63	+1,17	-0,29	+0,84	+0,63	+2,27	+0,46	-0,28	+1,01	+1,07
30	+0,10	+0,31	+0,16	+0,40	-0,26	+1,82	-0,26	+0,19	+1,04	+0,68

This table will allow to compare your ZSCORE from one PT to another because the standard deviation has always the value of SR of the method SR : Cf page 7 and 8 /13

In yellow the values bigger or smaller than 2/-2

In red the values bigger or smaller than 3/-3

Figure 3 :

Zscore of the different laboratories for each sample. ZS calculated on the standard deviation of reproducibility of the method

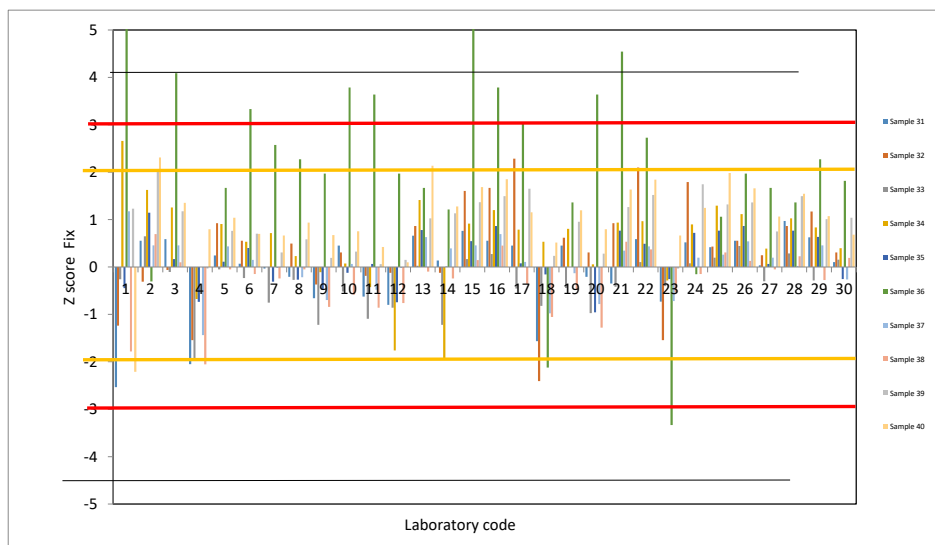


Table VII : Zscore of the different laboratories for each sample.
ZS calculated on AVT and standard deviation of reproducibility of the method

Sample Lab code	1	2	3	4	5	6	7	8	9	10
31	+0,10	+0,31	-0,23	+0,49	+0,21	+1,06	+0,43	+0,28	+1,07	+1,93
32	+0,52	+0,37	+0,29	+0,98	+0,73	+1,97	+0,72	+0,52	+1,09	+1,57
33	+0,69	+0,74	+0,66	+1,65	+0,92	+2,88	+1,46	+0,45	+1,34	+2,00
34	+0,66	+1,91	-0,25	+0,51	-0,43	+3,03	+0,02	+0,08	+0,21	+1,05
35	+1,22	+0,43	+0,12	+0,72	+1,21	+0,15	+1,33	+2,10	+3,38	+2,45
36	+0,07	-0,19	+0,10	+0,86	+0,10	+2,42	+0,28	-0,53	+0,74	+1,17
37	+0,03	+1,54	+0,39	+1,55	+0,32	+2,27	+0,78	+0,47	+1,33	+2,13
38	+0,38	+0,31	-0,17	-0,02	+0,16	+1,97	-0,15	+0,02	+0,26	+0,86
39	+0,28	+0,37	-0,10	-1,06	+0,00	+1,82	+0,04	+0,16	+0,11	+0,80
40	-0,07	+2,28	-4,87	-7,05	-3,41	+6,52	-0,54	-3,77	-6,29	+1,41
41	+0,94	+0,93	+0,43	+1,51	+1,20	+1,82	+0,24	+0,40	+1,53	+1,65
42	-0,17	+0,43	+0,13	+1,08	+0,12	+0,91	+0,17	-0,06	+0,70	+1,73
43	-0,52	+0,25	-2,84	-0,36	-0,80	+1,67	-0,41	-0,83	-1,66	+0,76
44	+4,44	+3,02	+0,83	+0,36	+0,70	+2,73	+0,30	+0,15	+0,61	+1,42
45	-0,07	+0,68	-1,30	-1,82	-0,09	+1,36	+0,74	-1,36	-1,08	+1,59
46	+0,28	+1,85	-0,61	-2,39	-2,30	+3,64	+1,76	-0,50	-1,88	-1,82
47	+0,31	+0,31	-0,04	+0,64	+0,49	+0,76	+0,50	+0,06	+0,80	+1,94
48	+0,03	+0,37	-0,40	+0,73	+1,06	+2,58	-0,15	-0,03	+1,31	+1,47
49	+0,73	+1,11	-0,70	-0,73	-0,26	+2,27	+0,57	+0,18	-0,87	+0,83
50	+1,60	+1,85	+1,22	+1,58	+1,42	+2,88	+0,78	+0,97	+2,07	+2,23
51	-0,21	-0,56	+0,16	+0,95	+0,24	+1,97	+0,52	+0,26	+1,15	+1,49
52	+0,49	+0,86	-0,12	+1,12	+0,57	+1,67	+0,24	+0,13	+1,21	+1,51
53	-0,28	+0,12	-0,74	-2,85	-0,61	+1,97	-0,28	-1,93	-2,26	-0,92
54	-1,56	+0,37	-2,73	-3,03	-2,09	+4,55	-0,70	-1,91	-3,07	-1,47
55	+1,35	+0,56	+1,17	+1,51	+0,72	+2,73	+0,89	+1,07	+1,18	+2,69
56	+1,46	+0,93	+1,05	+2,03	+1,10	+2,42	+0,91	+1,07	+2,04	+3,11
57	+2,19	+2,28	+3,10	+3,93	+3,82	+3,33	+3,02	+2,96	+4,71	+5,23

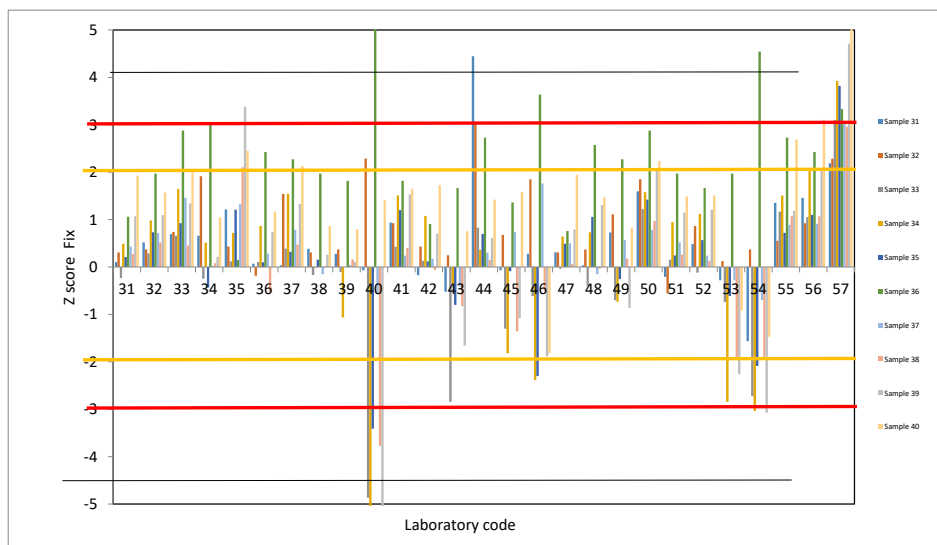
This table will allow to compare your ZSCORE from one PT to another because the standard deviation has always the value of SR of the method SR : Cf page 7 and 8 /13

In yellow the values bigger or smaller than 2/-2

In red the values bigger or smaller than 3/-3

Figure 3 :

Zscore of the different laboratories for each sample. ZS calculated on the standard deviation of reproducibility of the method



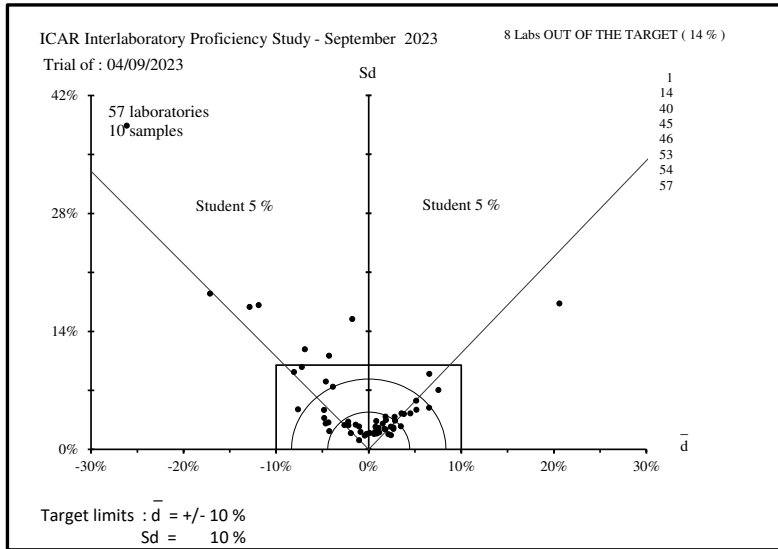


Figure 1 : ACCURACY - Evaluation of the individual performances (to see table I).



ICAR
PROFICIENCY TESTING SCHEME

September 2023

Raw Milk

Enumeration of SOMATIC CELLS

Lyo A-B Samples

Sending date of statistical treatment : 28th September 2023

Frame of activity :	ICAR Milk Analyses Sub Committee (MA SC)
ICAR Staff	Silvia Orlandini pt@icar.org silvia@icar.org

Proficiency test accredited ISO 17043



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Table I : Ranking of the laboratories in %

Nb	%	N°	d	Sd	D	Method
1	2	20	+ 0%	1%	1%	B
2	5	39	- 0%	1%	1%	B
3	7	52	+ 0%	2%	2%	B
4	9	47	- 0%	2%	2%	B
5	11	31	- 2%	1%	2%	B
6	14	2	+ 1%	2%	2%	B
7	16	33	+ 2%	0%	2%	B
8	18	38	- 0%	3%	3%	B
9	20	53	- 3%	1%	3%	B
10	23	30	- 3%	2%	3%	B
11	25	16	+ 3%	2%	3%	B
12	27	12	- 3%	2%	3%	B
13	30	8	- 2%	3%	4%	B
14	32	17	- 2%	3%	4%	B
15	34	1	- 4%	0%	4%	A
16	36	23	- 4%	0%	4%	C
17	39	15	+ 4%	2%	4%	B
18	41	54	- 1%	5%	5%	B
19	43	51	+ 2%	4%	5%	C
20	45	10	- 4%	3%	5%	B
21	48	13	+ 3%	4%	5%	A
22	50	7	+ 4%	3%	5%	B
23	52	11	- 5%	1%	5%	B
24	55	19	- 1%	5%	5%	B
25	57	21	- 0%	5%	5%	B
26	59	9	- 4%	4%	6%	B
27	61	18	+ 3%	7%	7%	B
28	64	34	+ 6%	4%	7%	B
29	66	48	- 5%	6%	7%	B
30	68	42	+ 2%	8%	8%	B

Nb	%	N°	d	Sd	D	Method
31	70	50	+ 4%	7%	8%	B
32	73	3	+ 5%	7%	9%	B
33	75	37	+ 6%	6%	9%	B
34	77	43	- 8%	4%	9%	B
35	80	46	+ 7%	8%	11%	A
36	82	4	+ 13%	16%	21%	B
37	84	57	+ 17%	15%	23%	C
38	86	14	+ 23%	15%	27%	B
39	89	35	+ 17%	27%	32%	B
40	91	22	- 19%	26%	32%	B
41	93	40	- 11%	38%	39%	C
42	95	41	- 29%	42%	51%	A
43	98	55	+ 41%	47%	62%	C
44	100	56	+ 54%	50%	73%	C
N.C.		5				B
N.C.		6				B
N.C.		24				B
N.C.		25				B
N.C.		26				B
N.C.		27				B
N.C.		28				B
N.C.		29				B
N.C.		32				B
N.C.		36				B
N.C.		44				B
N.C.		45				B
N.C.		49				B

- A ISO 13366-1 | IDF 148-1
- B ISO 13366-2 | IDF 148-2
- C Image Cytometry

(NC : OUT of RANKING because of insufficient data number)

(Nb : laboratory rank; % : relative rank)

(N° : laboratory identification number)

(d et Sd : mean and standard deviation of the differences (laboratory -reference))

(D : Euclidian distance to YX-axis origin = SQUARE ROOT.(d² + Sd²))

The table should be studied in parallel with figure 1 where the laboratories are located according to an acceptability area (or target) the limits of which are :

$$\pm 10\% \text{ for } d \text{ and } 10\% \text{ for } Sd$$

REF : Assigned values are robust average values per sample according to algorithm A of standard ISO 13528, of 37 laboratories using reference method ISO 13366-1|IDF 148-1 and alternative method ISO 13366-2|IDF 148-2 after outlier discarding using Grubbs test at 5% risk level

Note : Limits are only indicative and so far do not constitute standard values; they indicate what is normally reachable by labs for their self evaluation.

Repeatability standard deviation of this ICAR proficiency test (after Cochran elimination at 5 %) S_{rPT} 12 2%

Reproducibility standard deviation of this ICAR proficiency test (after Cochran and Grubbs elimination at 5 %) S_{RPT} 51 10%

Table II : REPEATABILITY - Absolute difference between replicates in 10^3 cells / ml

Sample Lab code	A	B	Sr	NL
1	0	0	0	4
2	5	13	7	4
3	15	14	10	4
4	9	63	32	4
5	**	**		
6	**	**		
7	9	1	5	4
8	4	5	3	4
9	6	30	15	4
10	5	4	3	4
11	3	34	17	4
12	13	10	8	4
13	11	31	16	4
14	0	0	0	4
15	18	7	10	4
16	10	11	7	4
17	5	17	9	4
18	4	19	10	4
19	4	3	3	4
20	13	5	7	4
21	7	60	30	4
22	0	0	0	4
23	1	12	6	4
24	**	**		
25	**	**		
26	**	**		
27	**	**		
28	**	**		
29	**	**		
30	7	14	8	4

Sample Lab code	A	B	Sr	NL
31	3	12	6	4
32	**	**		
33	16	33	18	4
34	1	1	1	4
35	41	*88*	49	4
36	**	**		
37	9	14	8	4
38	11	3	6	4
39	3	6	3	4
40	17	28	16	4
41	8	1	4	4
42	12	28	15	4
43	4	7	4	4
44	**	**		
45	**	**		
46	4	6	4	4
47	4	24	12	4
48	19	17	13	4
49	**	**		
50	6	35	18	4
51	**	**		
52	6	12	7	4
53	11	39	20	4
54	5	13	7	4
55	13	28	15	4
56	14	48	25	4
57	12	2	6	4
Sr	8	19		172
r	42	126		
NE	86	86		
L	29	71		

Sr : repeatability standard deviation of each laboratory limit : Cf up down

NL : number of measurements per laboratory

L : Limit for difference between duplicates according Cochran test at 5% level.

SE : repeatability standard deviation per sample

NE : number of measurements per sample

*: discarded data using the test of Cochran at 5 %

** : missing data

r : limit of repeatability, absolute difference between two replicates according ISO 13366-2 / IDF 148-2 : Cf up down

Level 10^3 / ml	Sr %	r
150	6	25
200	5	42
450	4	50
750	3	63
1500	3	126

Table III : Means of the replicates in 10³ cells / ml

Sample Lab code	A	B	Sample Lab code	A	B
1	170	840	31	182	848
2	203	861	32		
3	189	913	33	200	876
4	201	990	34	236	880
5			35	178	1051
6			36		
7	202	895	37	200	917
8	186	840	38	197	849
9	185	826	39	192	855
10	178	830	40	272 *	663
11	157	838	41	190	552 *
12	181	839	42	169	900
13	219	861	43	165	806
14	253	1034	44		
15	216	878	45		
16	210	869	46	195	929
17	191	841	47	180	867
18	178	901	48	184	816
19	203	837	49		
20	194	861	50	185	911
21	208	840	51	184	889
22	182	665	52	183	868
23	169	839	53	171	851
24			54	169	876
25			55	232	1251 *
26			56	286 *	1327 *
27			57	224	1009
28			M	192	868
29			REF.	188	861
30	181	841	SD	20	73
			AVT	188	860

M = mean per sample

SD = standard deviation per sample

AVT = Assign value traceable to the ERM BD001

REF : Assigned values are robust average values per sample according to algorithm A of standard ISO 13528, of 37 laboratories using the reference method ISO 13366 | IDF 148-1 and alternative method ISO 13366-2 | IDF 148-2, after outlier discarding using Grubbs test at 5% risk level

Table IV : Outlier identification

Sample	A	B
Outliers Cochran	35	35
Outlier Grubbs	40, 56	41, 55, 56
sr	6	16
SR	21	69
sr %	3%	2%
SR %	11%	8%
SR Method for AVT values	16	51

REF. = reference values

*: discarded data using the test of Grubbs 5 %

Table V : ACCURACY - differences (laboratory - reference) in %

Sample Lab Code	A	B	d	Sd _{lab}	t
1	- 10%	- 2%	- 4%	0%	13,52
2	+ 7%	- 0%	+ 1%	2%	0,87
3	+ 0%	+ 6%	+ 5%	7%	1,00
4	+ 6%	+ 15%	+ 13%	16%	1,21
5					
6					
7	+ 7%	+ 4%	+ 4%	3%	2,30
8	- 1%	- 3%	- 2%	3%	1,26
9	- 2%	- 4%	- 4%	4%	1,22
10	- 6%	- 4%	- 4%	3%	2,07
11	- 17%	- 3%	- 5%	1%	6,48
12	- 4%	- 3%	- 3%	2%	2,11
13	+ 16%	- 0%	+ 3%	4%	0,94
14	+ 34%	+ 20%	+ 23%	15%	2,19
15	+ 15%	+ 2%	+ 4%	2%	3,81
16	+ 11%	+ 1%	+ 3%	2%	1,98
17	+ 1%	- 2%	- 2%	3%	0,82
18	- 6%	+ 5%	+ 3%	7%	0,58
19	+ 8%	- 3%	- 1%	5%	0,26
20	+ 3%	- 0%	+ 0%	1%	0,69
21	+ 10%	- 2%	- 0%	5%	0,06
22	- 3%	- 23%	- 19%	26%	1,07
23	- 11%	- 3%	- 4%	0%	17,30
24					
25					
26					
27					
28					
29					
30	- 4%	- 2%	- 3%	2%	2,28

Sample Lab Code	A	B	d	Sd _{lab}	t
31	- 4%	- 2%	- 2%	1%	3,17
32					
33	+ 6%	+ 2%	+ 2%	0%	10,04
34	+ 25%	+ 2%	+ 6%	4%	2,25
35	- 6%	+ 22%	+ 17%	27%	0,89
36					
37	+ 6%	+ 6%	+ 6%	6%	1,49
38	+ 4%	- 2%	- 0%	3%	0,23
39	+ 2%	- 1%	- 0%	1%	0,36
40	+ 44%	- 23%	- 11%	38%	0,41
41	+ 1%	- 36%	- 29%	42%	0,99
42	- 10%	+ 4%	+ 2%	8%	0,33
43	- 12%	- 6%	- 8%	4%	2,45
44					
45					
46	+ 3%	+ 8%	+ 7%	8%	1,21
47	- 5%	+ 1%	- 0%	2%	0,21
48	- 3%	- 5%	- 5%	6%	1,24
49					
50	- 2%	+ 6%	+ 4%	7%	0,87
51	- 2%	+ 3%	+ 2%	4%	0,72
52	- 3%	+ 1%	+ 0%	2%	0,09
53	- 10%	- 1%	- 3%	1%	4,10
54	- 11%	+ 2%	- 1%	5%	0,17
55	+ 23%	+ 45%	+ 41%	47%	1,25
56	+ 52%	+ 54%	+ 54%	50%	1,53
57	+ 19%	+ 17%	+ 17%	15%	1,63
d	+ 2%	+ 1%	- 3%	14%	
Sd	11%	8%			

d = mean of differences Sd = standard deviation of differences t = Student test - comparison to 0

Upper limits : $\bar{d} = +/- 10\%$ Sd = 10%

ISO 13366-2|IDF 148-2 : Precision of the method :

Level SCC *10 ³ /ml	Sr %	r	SR %	R
150	6	25	9	38
200	5	42	8	67
450	4	50	7	88
750	3	63	6	126
1500	3	126	6	252

Table VI : Zscore of the different laboratories for each sample. ZS calculated on the PT standard deviation

Sample Lab code	A	B
1	-0,91	-0,30
2	+0,69	-0,01
3	+0,00	+0,71
4	+0,59	+1,76
5		
6		
7	+0,64	+0,46
8	-0,12	-0,30
9	-0,17	-0,49
10	-0,54	-0,43
11	-1,58	-0,32
12	-0,39	-0,31
13	+1,48	-0,01
14	+3,19	+2,37
15	+1,36	+0,22
16	+1,06	+0,10
17	+0,10	-0,29
18	-0,52	+0,54
19	+0,72	-0,34
20	+0,25	-0,01
21	+0,94	-0,30
22	-0,32	-2,70
23	-0,99	-0,31
24		
25		
26		
27		
28		
29		
30	-0,39	-0,28

In yellow the values bigger or smaller than 2/-2

In red the values bigger or smaller than 3/-3

Figure 2 : Zscore of the different laboratories for each sample. ZS calculated on the PT standard deviation

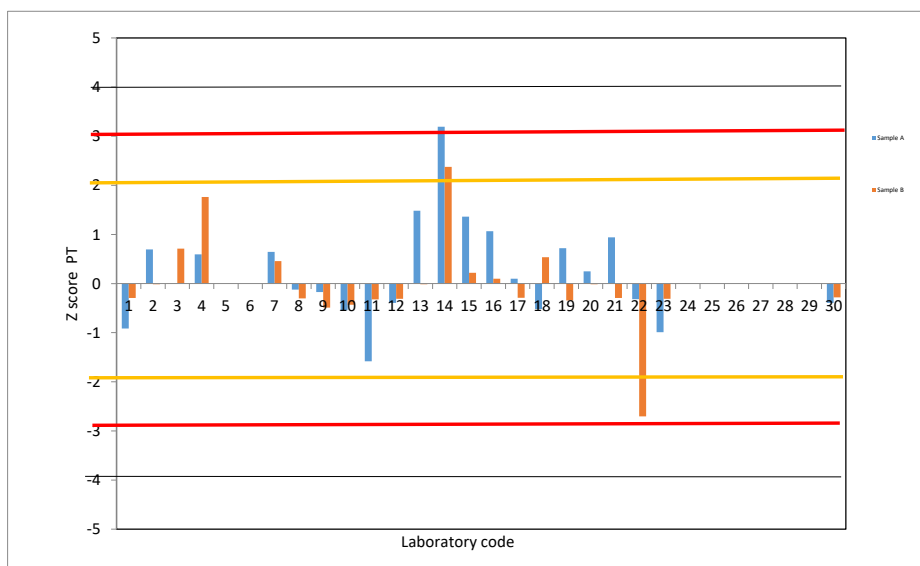


Table VI : Zscore of the different laboratories for each sample. ZS calculated on the PT standard deviation

Sample Lab code	A	B
31	-0,35	-0,18
32		
33	+0,57	+0,19
34	+2,33	+0,25
35	-0,54	+2,61
36		
37	+0,54	+0,76
38	+0,40	-0,18
39	+0,15	-0,09
40	+4,11	-2,73
41	+0,07	-4,27
42	-0,96	+0,53
43	-1,16	-0,77
44		
45		
46	+0,32	+0,93
47	-0,42	+0,08
48	-0,25	-0,63
49		
50	-0,17	+0,68
51	-0,22	+0,38
52	-0,27	+0,09
53	-0,89	-0,15
54	-0,99	+0,19
55	+2,13	+5,36
56	+4,82	+6,41
57	+1,76	+2,03

In yellow the values bigger or smaller than 2/-2

In red the values bigger or smaller than 3/-3

Figure 2 : Zscore of the different laboratories for each sample. ZS calculated on the PT standard deviation

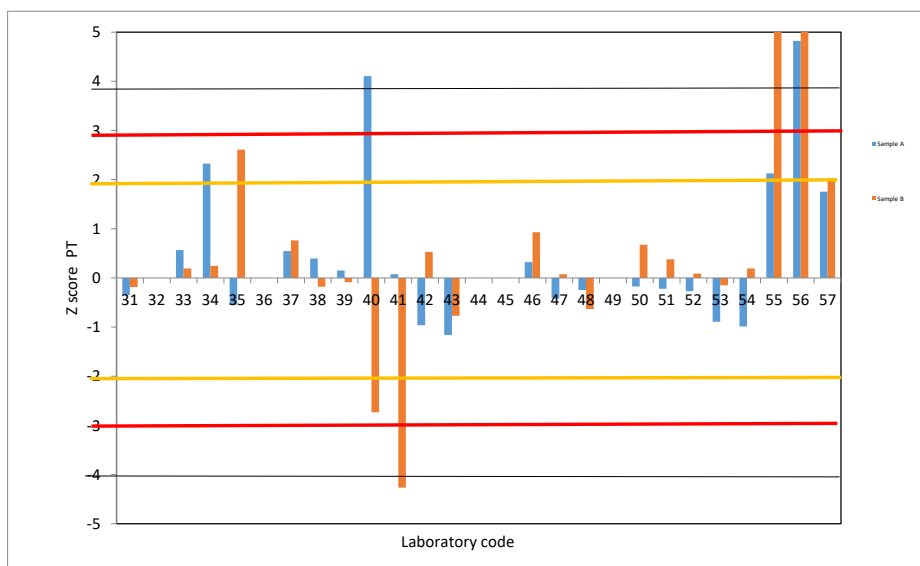


Table VII : Zscore of the different laboratories for each sample.
ZS calculated on AVT and standard deviation of reproducibility of the method

Sample Lab code	A	B
1	-1,10	-0,39
2	+0,88	+0,01
3	+0,03	+1,04
4	+0,76	+2,53
5		
6		
7	+0,82	+0,67
8	-0,12	-0,40
9	-0,18	-0,66
10	-0,64	-0,59
11	-1,92	-0,43
12	-0,46	-0,41
13	+1,86	+0,01
14	+3,96	+3,40
15	+1,71	+0,34
16	+1,34	+0,17
17	+0,15	-0,38
18	-0,61	+0,79
19	+0,91	-0,46
20	+0,34	+0,01
21	+1,19	-0,39
22	-0,37	-3,81
23	-1,19	-0,41
24		
25		
26		
27		
28		
29		
30	-0,46	-0,37

This table will allows to compare your ZSCORE from one PT to an other because the standard deviation has always the value of SR of the method SR : Cf page 7 and 8 /13

In yellow the values bigger or smaller than 2/-2

In red the values bigger or smaller than 3/-3

Figure 3 :

Zscore of the different laboratories for each sample. ZS calculated on the standard deviation of reproducibility of the method

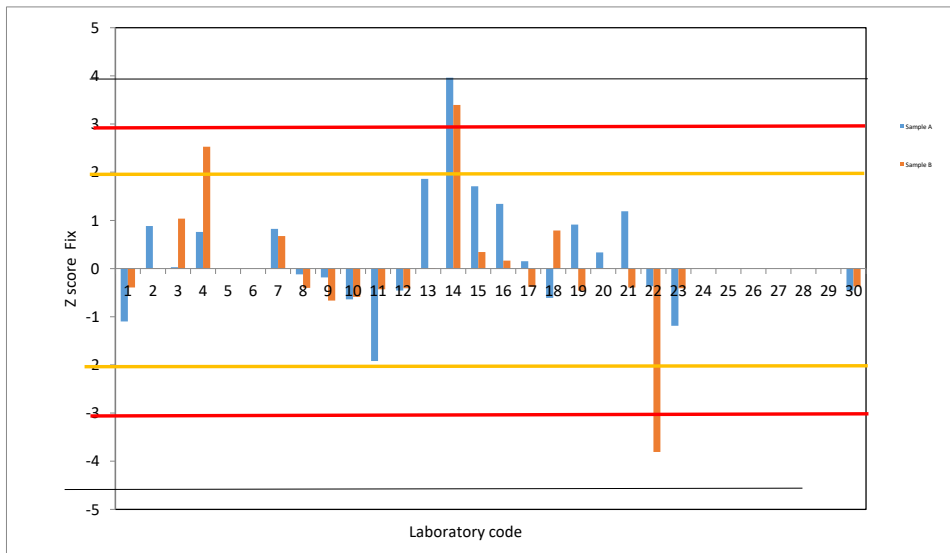


Table VII : Zscore of the different laboratories for each sample.
ZS calculated on AVT and standard deviation of reproducibility of the method

Sample Lab code	A	B
31	-0,40	-0,23
32		
33	+0,73	+0,30
34	+2,90	+0,38
35	-0,64	+3,73
36		
37	+0,70	+1,11
38	+0,52	-0,22
39	+0,21	-0,10
40	+5,09	-3,85
41	+0,12	-6,03
42	-1,16	+0,78
43	-1,40	-1,06
44		
45		
46	+0,43	+1,35
47	-0,49	+0,14
48	-0,27	-0,87
49		
50	-0,18	+0,99
51	-0,24	+0,57
52	-0,30	+0,16
53	-1,07	-0,19
54	-1,19	+0,30
55	+2,65	+7,64
56	+5,98	+9,12
57	+2,20	+2,91

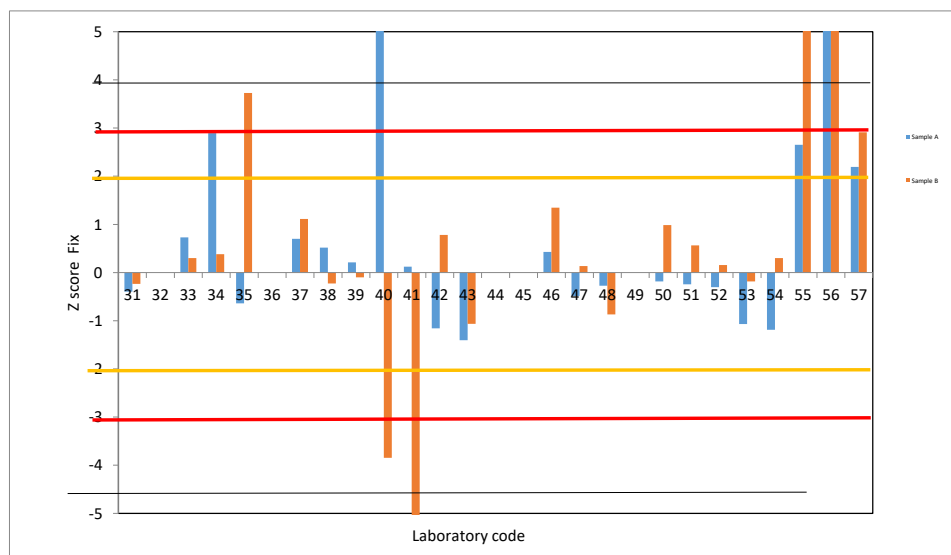
This table will allows to compare your ZSCORE from one PT to an other because the standard deviation has always the value of SR of the method SR : Cf page 7 and 8 /13

In yellow the values bigger or smaller than 2/-2

In red the values bigger or smaller than 3/-3

Figure 3 :

Zscore of the different laboratories for each sample. ZS calculated on the standard deviation of reproducibility of the method



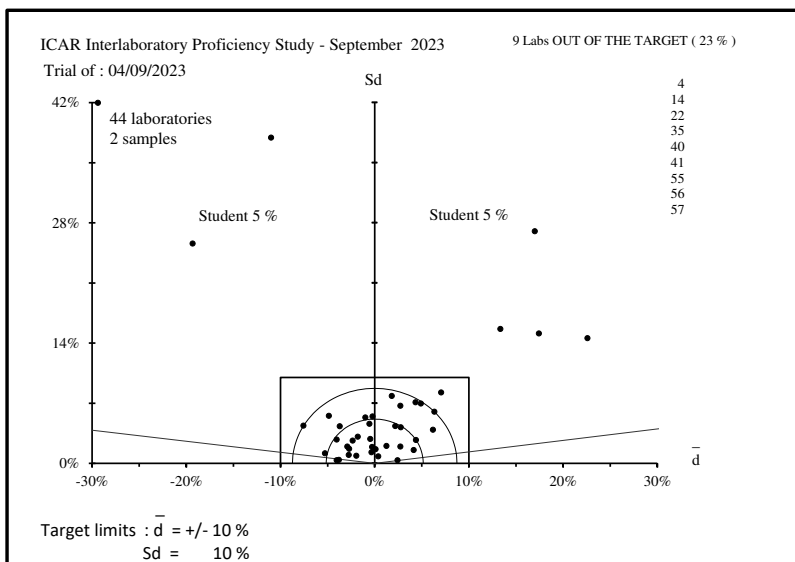


Figure 1 : ACCURACY - Evaluation of the individual performances (to see table I).