THE GLOBAL STANDARD
FOR LIVESTOCK DATA

Network. Guidelines. Certification.

FRAME OF ACTIVITY : ICAR MILK ANALYSES SUB-COMMITTEE (MA SC)

ICAR - Proficiency Testing Scheme
Raw cow milk

Chemical “Reference” Methods

ORGANISER: ICAR, VIA SAVOIA 78, I-00198 ROME, ITALY

THE GLOBAL STANDARD
FOR LIVESTOCK DATA

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1.Introduction

Dear Participant,

Thank you for participating in the ICAR Proficiency Test (PT) September 2016 !

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. It's 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 all 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 H will help you to follow your performance over the time.

A) In table A you find your participation codes 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) In this table is reported if some of your results are outlier for Grubbs or Cochran test

E) The evaluation of repeatability of the results should be one of the first controls before communication of the data. In table E 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.

F) In table E the results of your Z-Score$_{PT}$ (standard deviation calculated on this proficiency test) and the Z-Score$_{FIX}$ (standard deviation of the reference method) are summarized. If you have obtained all the -2<Z-Score results<+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.

G) 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. According the results obtained the MA SC will decide eventually to revise. During the meeting of Milk Analyses Sub Committee held in

Copenhagen in June 2016 the experts decided to update the limit of the box to evaluate the accuracy.

H) The control charts have been created using your data obtained with the Z-Score$_{PT}$ and Z-Score$_{FIX}$. The standard deviation of the method will be the same in the next PT round and it will facilitate the comparison of your performance over the time.

Your Control Charts have been updated with data of the previous ICAR PT if you have participated.

The sample preparation and statistical elaboration have been done by ICAR Sub- contractor Actalia, accreditated to ISO 17043.

In the second part of the report the statistical elaboration followed the template approved by ICAR's Milk Analyses Sub Committee chaired by Dr. Gavin Scott (NZ). 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.

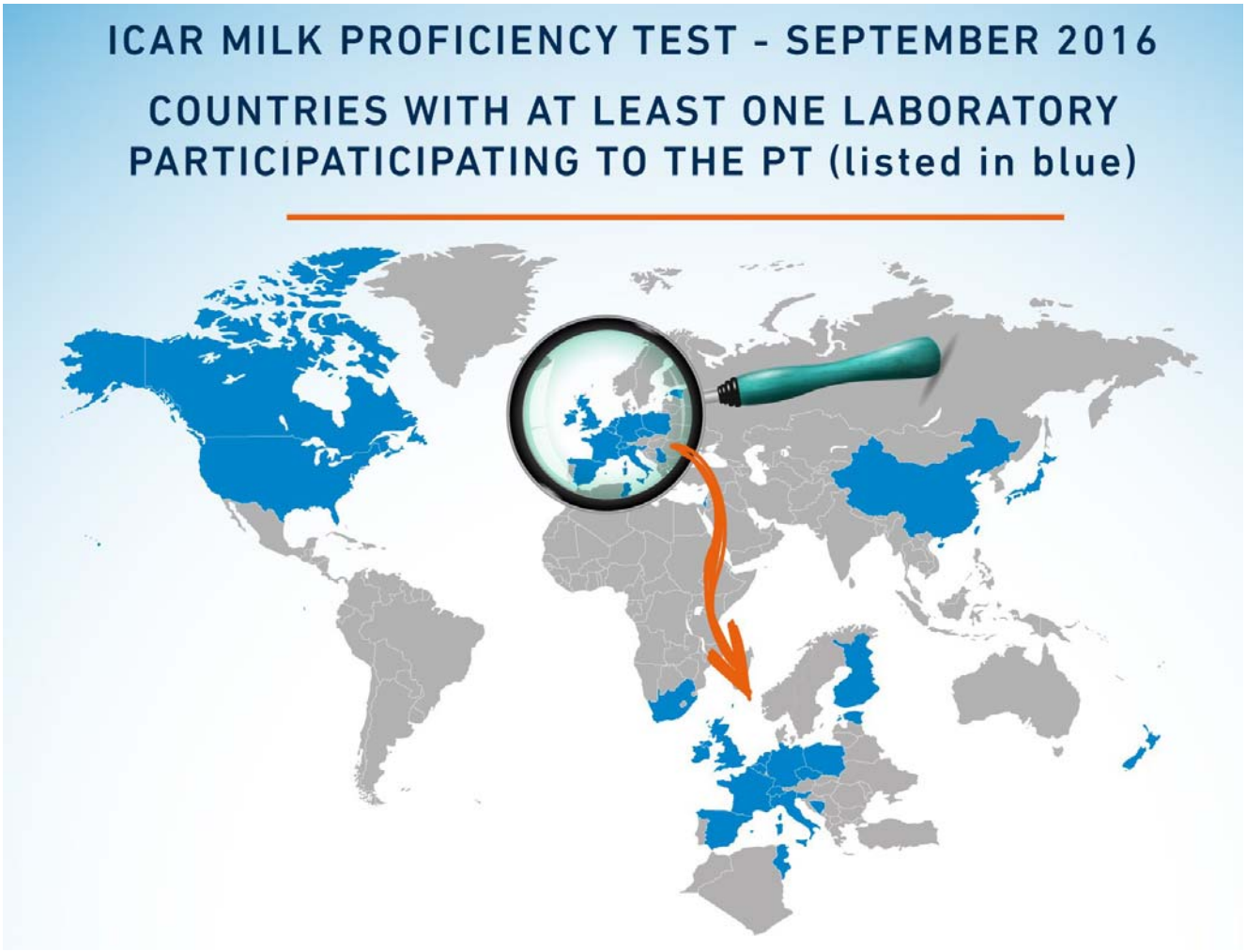
For each parameter the SR=standard deviation of reproducibility has been calculated after the outlier elimination. If you have participated, and your results are in the repeatability limits, you can use this value for the calculation of your uncertainty of measurement.

ICAR would like to see, in the next years, this 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 all ICAR reference laboratories and those participated in ICAR PT 2016 with at least one parameter is reported below and upload on ICAR website

http://www.icar.org/index.php/icar-certifications/milk-laboratories-proficiency-test-2016/


ICAR MILK PROFICIENCY TEST - SEPTEMBER 2016
COUNTRIES WITH AT LEAST ONE LABORATORY
PARTICIPATICIPATING TO THE PT (listed in blue)

ICAR Member having a milk laboratory participating in at least one ICAR Proficiency Round Test in 2016	
Comité du Lait ASBL	Belgium
Département Valorisation des Productions agricoles (DVP), Centre Wallon de Recherche Agronomique – CRA -W	Belgium
T&V – ILVO Eenheid Technologie en Voeding Productkwaliteit en Voedselveiligheid	Belgium
Valacta – Centre d'Expertise en Production Laitière du Québec	Canada
Dairy Cattle Research Center of Shandong Academy of Agricultural Science	China
University of Zagreb, Faculty of Agriculture, Department of Dairy Science, Reference Laboratory for Milk and Dairy Products	Croatia
Laborator pro rozbor mléka Bustehrad, Ceskomoravská spolecnost chovatelú a.s.	Czech Republic
Milkom a.s Dairy research institute	Czech Republic
Eurofins Steins Laboratorium A/S	Denmark
Eesti Pollumajandusloomade Joudluskontrolli AS, Milk Analysing Laboratory	Estonia
VALIO R & D Chemistry	Finland
ACTALIA / ACTILAIT / CECALAIT	France
Milchprüfring Baden-Württemberg e.V., Zentrallabor Kirchheim	Germany
ÁT. KFT. Tejvizsgáló Laboratórium (Livestock Performance Testing Ltd)	Hungary
Teagasc, Technical Services Laboratory	Ireland
Central Milk Laboratory – ICBA	Israel
Associazione Italiana Allevatori, Laboratorio Standard Latte (LSL-AIA)	Italy
Federazione Latterie Alto Adige Soc. Agr. Coop.	Italy
Japan Dairy Technical Association	Japan
State Laboratory for Milk Control Pieno Tyrimai	Lithuania
MilTestNZ	New Zealand
Laboratorium Oceny Mleka, Krajowego Centrum Hodowli Zwierzat (KCHZ), Laboratorium Referencyjne z siedziba w Parzniewie	Poland
PFHBiPM Laboratorium w Bialymstoku zs.w jezewie Starym	Poland
PFHBiPM Laboratorium w Kobiernie	Poland
PFHBiPM Laboratorium w Parzniewie	Poland
PFHBiPM Region Oceny Bydgoszcz z/s w Minikowie	Poland
Laboratorija za ispitivanje kvaliteta mleka, Poljoprivredni fakultet Novi Sad,	Serbia
Plemenárske sluzby SR s.p.	Slovak Republic
University of Ljubljana, Biotechnical Faculty, Zootech. Dept., Laboratory for Dairying	Slovenia
Deltamune	South Africa
Lactolab	South Africa
Merieux Nutriscience South Africa	South Africa

ICAR Member having a milk laboratory participating in at least one ICAR Proficiency Round Test in 2016	
Merieux Nutriscience South Africa (Midrand)	South Africa
Laboratorio Agroalimentario de Santander	Spain
Agroscope, Institute for Food Sciences IFS	Switzerland
Suisselab AG	Switzerland
Qlip N.V.	The Netherlands
Direction de l' Amelioration Genetique	Tunisia
Cattle Information Service (CIS)	United Kingdom
Eastern Laboratory Services	USA
Vetlab Agricultural Showgrouds	Zambia

ICAR Member with no milk laboratory participating in any ICAR Proficiency Round Test in 2016	
INTI - Lacteos	Argentina
Milchprüfring Süd	Austria
Shanghai Dairy Cattle Breeding Center Co., Ltd	China
Institute of Food Safety, Animal Health and Environment BIOR, Laboratory of Food and Environmental Investigations	Latvia
TINE, Centre for R&D	Norway
Milk Laboratory, Slovak Agricultural Research Centre	Slovak Republic
Veterinárny a potravinový ústav Bratislava	Slovak Republic
ANPI Dairy Laboratory	South Africa
Eurofins Steins Laboratorium AB	Sweden
Milk Analysis Laboratory, Hsin-chu Branch, Livestock Research Institute, Council of Agriculture	Taiwan
National Milk Records plc / Direct laboratories	UK

Attached to this report you find the certificate of your participation in the ICAR PT.-

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

Chemical Reference Methods

Laboratory participation codes and Performance analyses

ICAR PT September 2016

Laboratory Name	

A — Your participation Codes

	Fat$_{ref}$	Protein$_{ref}$	Lactose$_{ref}$	Urea$_{ref}$	SCCref/alt
Subscription	Yes				
Participation Codes	7				
Are all the sample results received ?	Yes				

B — Data received on time

Yes	No	Deadline
		19.09.2016

C — Have you sent the data with the correct units of measurements ?

Fat	Protein*	Lactose	Urea	SCC
g/100g	nitrogen g/100g	g/100g	mg/dl	SCC*1000/ml
Yes	Yes			

*It was requested to report the value in total nitrogen

D — Outliers

Fat	Protein	Lactose	Urea	SCC
Sample	Sample	Sample	Sample	Sample
g/100g	nitrogen g/100g	g/100g	mg/dl	SCC*1000/ml
	Samples			
	4,7,10			

E — Repeatability

Your "r" performance

Fat	Protein	Lactose	Urea	SCC
g/100g	nitrogen g/100g	g/100g	mg/dl	SCC*1000/ml

If the repeatability in 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.

Limits

Fat	Protein	Lactose	Urea	SCC	
g/100g	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	
				Level	r
0,043	0,038	0,06	1,52	150	25
				300	42
				450	51
				750	64
				1500	126

F — Z-Score

Your Z-Score PT

Fat	Protein	Lactose	Urea	SCC
	Samples 7,1			

Your FIX Z-Score

Fat	Protein	Lactose	Urea	SCC

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.

Interpretation Z-Score

-2<Z-Score<2	-3<Z-Score<-2	2<Z-Score<3	Z-Score<-3	Z-Score>3
Good	Moderate	Moderate	Poor	Poor

G — Ranking of your lab

Mean difference and standard deviation of difference

Fat	Protein	Lactose	Urea	SCC

If d and sd are in the limit (see Table 1 and Figure 1) the cells are in green

Indicative Limits defined in the ICAR MA SC

Fat	Protein	Lactose	Urea	SCC
g/100g	g/100g	g/100g	mg/dl	SCC*1000/ml
d=0,02	d=0,025	d=0,10	d=2,5	d=10%
sd=0,03	sd=0,020	sd=0,10	sd=1,5	sd=10%

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

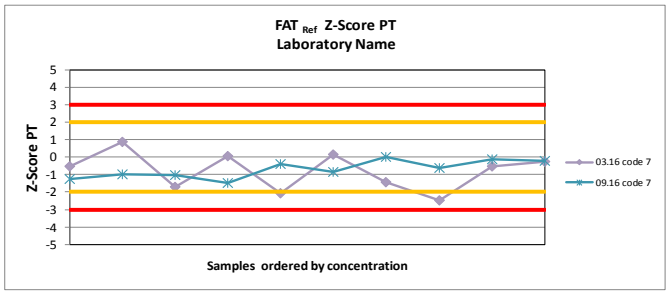
Legenda:

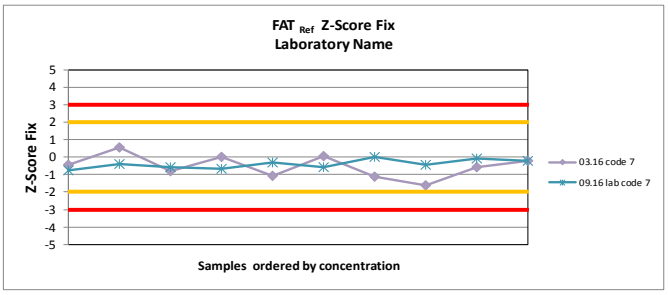
- positive performance for all the sample
- same sample showed a performance out of range or there are miss data
- The parameter was not analyzed

H

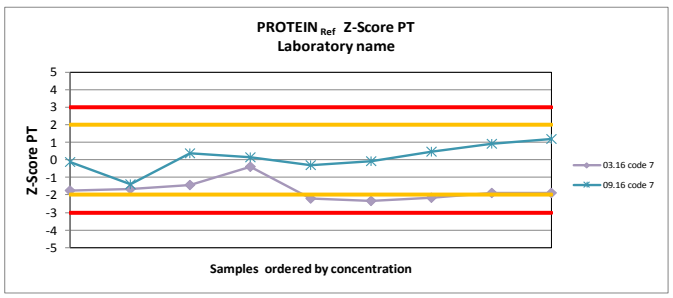
Control Charts

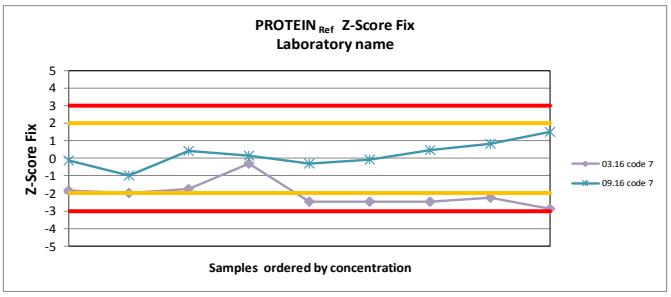
Control Charts Fat





Control Charts Protein





Control Charts Lactose

The laboratory did not participated

Control Charts Urea

The laboratory did not participated

Control Charts SCC

The laboratory did not participated

ICAR
PROFICIENCY TESTING SCHEME

September 2016

Raw Milk

Determination of FAT CONTENT

Röse Gottlieb method

Sending date of statistical treatment : 29th september 2016

Frame of activity :	ICAR Milk Analyses Sub Committee (MA SC)	
Contact :	Gavin Scott	gavin@milktest.co.nz
ICAR Staff	Silvia Orlandini	pt@icar.org silvia@icar.org

Proficiency test accreditated ISO 17043

ACTALIA CECALAIT

cofrac COMPARAISONS INTERLABORATOIRES

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

Nb	%	N°	d	Sd	D	Method
1	5	14	+ 0,004	0,004	0,005	A
2	10	13	+ 0,001	0,006	0,006	A
3	15	18	- 0,006	0,004	0,007	A
4	20	9	+ 0,000	0,007	0,007	A
5	25	2	+ 0,008	0,004	0,009	A
6	30	3	- 0,002	0,009	0,009	A
7	35	7	- 0,008	0,005	0,009	A
8	40	11	- 0,008	0,006	0,010	A
9	45	8	+ 0,009	0,006	0,011	A
10	50	20	+ 0,002	0,011	0,011	A
11	55	12	- 0,012	0,010	0,015	A
12	60	15	+ 0,007	0,014	0,016	A
13	65	17	+ 0,007	0,014	0,016	A
14	70	5	+ 0,013	0,010	0,016	A
15	75	1	+ 0,001	0,017	0,017	A
16	80	6	- 0,006	0,018	0,019	B
17	85	16	- 0,014	0,013	0,019	A
18	90	10	+ 0,018	0,011	0,022	A
19	95	4	- 0,016	0,017	0,023	A
20	100	19	+ 0,020	0,029	0,035	B

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 :

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

REF : Assigned values are robust average values per sample according to algorithm A of standard ISO 13528, of 18 laboratories using the reference method ISO 1211 / IDF 1, after outliers discarging using Grubbs test at 5% risk level,

A ISO 1211 IDF 1D Röse Gottlieb Method
B ISO 2446 / IDF 226 Gerber method

(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.(d^2 + Sd^2))

Repeatability standard deviation of this ICAR proficiency test (after Cochran elimination at 5 %) Sr_{PT} 0,005

Rep 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. SR_{PT} 0,015

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	0,009	0,009	0,002	0,012	0,004	0,005	0,005	0,005	0,005	0,005	20
2	0,005	0,000	0,003	0,000	0,005	0,007	0,000	0,000	0,004	0,002	0,003	20
3	0,007	0,002	0,005	0,011	0,027 *	0,002	0,015	0,002	0,002	0,007	0,008	20
4	0,003	0,004	0,023	0,002	0,004	0,006	0,014	0,003	0,001	0,004	0,006	20
5	0,010	0,010	0,010	0,000	0,000	0,000	0,000	0,010	0,000	0,010	0,005	20
6	0,019 *	0,019	0,030	0,010	0,010	0,010	0,000	0,019	0,010	0,029 *	0,013	20
7	0,005	0,007	0,022	0,006	0,015	0,000	0,004	0,003	0,015	0,003	0,007	20
8	0,001	0,004	0,003	0,007	0,006	0,003	0,007	0,003	0,006	0,007	0,004	20
9	0,002	0,011	0,014	0,004	0,003	0,001	0,001	0,004	0,002	0,008	0,005	20
10	0,008	0,005	0,011	0,006	0,007	0,012	0,007	0,010	0,012	0,013	0,007	20
11	0,001	0,002	0,004	0,006	0,005	0,009	0,005	0,003	0,005	0,002	0,003	20
12	0,004	0,004	0,008	0,002	0,008	0,006	0,001	0,004	0,007	0,005	0,004	20
13	0,003	0,002	0,001	0,002	0,006	0,015	0,006	0,006	0,006	0,007	0,005	20
14	0,003	0,013	0,001	0,004	0,003	0,005	0,005	0,007	0,001	0,001	0,004	20
15	0,004	0,003	0,001	0,004	0,004	0,002	0,003	0,010	0,012	0,094 *	0,021	20
16	0,001	0,003	0,001	0,009	0,006	0,014	0,003	0,009	0,013	0,018	0,007	20
17	0,004	0,004	0,006	0,005	0,007	0,008	0,005	0,012	0,009	0,009	0,005	20
18	0,006	0,008	0,008	0,015	0,002	0,004	0,002	0,005	0,001	0,001	0,005	20
19	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	20
20	0,007	0,007	0,009	0,001	0,012	0,003	0,003	0,007	0,003	0,002	0,004	20
Sr	0,004	0,005	0,008	0,004	0,007	0,005	0,004	0,005	0,005	0,016		400
NE	40	40	40	40	40	40	40	40	40	40		
L	0,013	0,021	0,032	0,017	0,020	0,020	0,017	0,021	0,020	0,020		

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 betwen 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	2,157	2,803	3,464	4,143	4,705	1,514 *	2,426	3,111	3,824	4,484
2	2,152	2,820	3,479	4,163	4,734	1,473	2,439	3,112	3,826	4,500
3	2,146	2,819	3,469	4,139	4,713	1,469	2,413	3,108	3,835	4,491
4	2,128	2,799	3,473	4,130	4,680	1,457	2,444	3,069	3,797	4,479
5	2,145	2,825	3,475	4,170	4,740	1,480	2,440	3,105	3,840	4,525
6	2,133	2,805	3,442	4,143	4,747	1,456	2,415	3,126	3,802	4,494
7	2,138	2,800	3,456	4,144	4,717	1,455	2,419	3,098	3,825	4,489
8	2,147	2,821	3,483	4,167	4,738	1,485	2,441	3,104	3,825	4,499
9	2,141	2,815	3,477	4,161	4,720	1,461	2,421	3,101	3,825	4,500
10	2,159	2,824	3,474	4,159	4,736	1,497	2,470 *	3,126	3,857	4,503
11	2,146	2,809	3,459	4,138	4,721	1,462	2,415	3,089	3,819	4,485
12	2,138	2,814	3,452	4,158	4,704	1,460	2,419	3,083	3,799	4,471
13	2,143	2,807	3,468	4,152	4,718	1,474	2,430	3,102	3,834	4,503
14	2,154	2,822	3,469	4,152	4,725	1,471	2,441	3,106	3,829	4,494
15	2,152	2,825	3,481	4,168	4,734	1,476	2,441	3,120	3,838	4,459
16	2,143	2,808	3,440	4,133	4,701	1,478	2,424	3,089	3,790	4,471
17	2,138	2,799	3,457	4,154	4,740	1,483	2,448	3,119	3,851	4,505
18	2,148	2,806	3,459	4,146	4,715	1,461	2,429	3,099	3,815	4,485
19	2,136	2,816	3,495	4,175	4,757	1,456	2,427	3,107	3,883	4,563 *
20	2,145	2,822	3,481	4,175	4,717	1,460	2,432	3,110	3,809	4,489
M	2,144	2,813	3,467	4,153	4,723	1,469	2,429	3,104	3,826	4,491
REF.	2,146	2,813	3,468	4,153	4,721	1,470	2,430	3,103	3,824	4,490
SD	0,008	0,009	0,014	0,014	0,018	0,012	0,011	0,014	0,022	0,015

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 18 laboratories using the reference method ISO 1211 / IDF 1, after outliers discarging using Grubbs test at 5 % risk level.

Table IV : Outlier identification

Sample	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Outliers Cochran	6				3					6;15
Outlier Grubbs						1	10			19
sr	0,003	0,005	0,008	0,004	0,005	0,005	0,004	0,005	0,005	0,005
SR	0,008	0,010	0,015	0,014	0,019	0,012	0,011	0,015	0,022	0,014

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	+ 0,011	- 0,010	- 0,004	- 0,010	- 0,016	+ 0,044	- 0,005	+ 0,007	- 0,001	- 0,007	+ 0,001	0,017	0,20
2	+ 0,006	+ 0,007	+ 0,011	+ 0,010	+ 0,013	+ 0,003	+ 0,009	+ 0,009	+ 0,002	+ 0,010	+ 0,008	0,004	6,97
3	- 0,000	+ 0,006	+ 0,001	- 0,014	- 0,008	- 0,001	- 0,018	+ 0,005	+ 0,011	+ 0,000	- 0,002	0,009	0,66
4	- 0,018	- 0,014	+ 0,005	- 0,023	- 0,041	- 0,013	+ 0,014	- 0,035	- 0,028	- 0,011	- 0,016	0,017	3,12
5	- 0,001	+ 0,012	+ 0,007	+ 0,017	+ 0,019	+ 0,010	+ 0,010	+ 0,002	+ 0,016	+ 0,035	+ 0,013	0,010	4,01
6	- 0,013	- 0,009	- 0,026	- 0,010	+ 0,026	- 0,014	- 0,015	+ 0,022	- 0,022	+ 0,003	- 0,006	0,018	1,02
7	- 0,008	- 0,014	- 0,012	- 0,009	- 0,004	- 0,015	- 0,011	- 0,006	+ 0,000	- 0,002	- 0,008	0,005	4,94
8	+ 0,001	+ 0,008	+ 0,015	+ 0,014	+ 0,017	+ 0,015	+ 0,010	+ 0,000	+ 0,001	+ 0,008	+ 0,009	0,006	4,40
9	- 0,005	+ 0,001	+ 0,009	+ 0,008	- 0,001	- 0,009	- 0,010	- 0,002	+ 0,001	+ 0,010	+ 0,000	0,007	0,10
10	+ 0,013	+ 0,010	+ 0,006	+ 0,006	+ 0,015	+ 0,027	+ 0,039	+ 0,023	+ 0,033	+ 0,012	+ 0,018	0,011	5,11
11	- 0,000	- 0,004	- 0,009	- 0,015	- 0,000	- 0,008	- 0,016	- 0,015	- 0,006	- 0,005	- 0,008	0,006	4,20
12	- 0,007	+ 0,001	- 0,016	+ 0,006	- 0,017	- 0,010	- 0,011	- 0,021	- 0,025	- 0,019	- 0,012	0,010	3,90
13	- 0,003	- 0,006	- 0,000	- 0,001	- 0,003	+ 0,004	- 0,000	- 0,001	+ 0,010	+ 0,012	+ 0,001	0,006	0,61
14	+ 0,008	+ 0,008	+ 0,001	- 0,001	+ 0,004	+ 0,001	+ 0,010	+ 0,002	+ 0,004	+ 0,003	+ 0,004	0,004	3,50
15	+ 0,006	+ 0,011	+ 0,013	+ 0,015	+ 0,013	+ 0,006	+ 0,010	+ 0,017	+ 0,014	- 0,031	+ 0,007	0,014	1,68
16	- 0,003	- 0,006	- 0,028	- 0,020	- 0,020	+ 0,008	- 0,007	- 0,015	- 0,035	- 0,019	- 0,014	0,013	3,59
17	- 0,008	- 0,014	- 0,011	+ 0,001	+ 0,019	+ 0,013	+ 0,017	+ 0,016	+ 0,026	+ 0,014	+ 0,007	0,014	1,65
18	+ 0,002	- 0,007	- 0,009	- 0,007	- 0,006	- 0,009	- 0,001	- 0,005	- 0,010	- 0,006	- 0,006	0,004	4,79
19	- 0,010	+ 0,003	+ 0,027	+ 0,022	+ 0,036	- 0,014	- 0,003	+ 0,004	+ 0,059	+ 0,073	+ 0,020	0,029	2,13
20	- 0,001	+ 0,008	+ 0,013	+ 0,022	- 0,004	- 0,010	+ 0,001	+ 0,006	- 0,016	- 0,001	+ 0,002	0,011	0,52
d	- 0,001	- 0,000	- 0,000	+ 0,001	+ 0,002	- 0,001	- 0,001	+ 0,001	+ 0,002	+ 0,000	+ 0,001	0,015	
Sd	0,008	0,009	0,014	0,014	0,018	0,012	0,011	0,014	0,022	0,015	0,014		

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

Upper limits : $\bar{d}$ = +/- 0,02 g / 100 g Sd = 0,03 g / 100g

ISO 1211 (2010) : 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	+1,41	-1,08	-0,31	-0,71	-0,86	+3,70	-0,45	+0,51	-0,03	-0,46
2	+0,75	+0,77	+0,76	+0,75	+0,71	+0,21	+0,78	+0,61	+0,08	+0,66
3	-0,00	+0,66	+0,05	-1,04	-0,45	-0,08	-1,63	+0,33	+0,49	+0,02
4	-2,25	-1,55	+0,33	-1,65	-2,24	-1,09	+1,23	-2,43	-1,25	-0,76
5	-0,07	+1,32	+0,51	+1,25	+1,07	+0,84	+0,87	+0,12	+0,71	+2,35
6	-1,62	-0,94	-1,84	-0,71	+1,46	-1,17	-1,40	+1,56	-1,00	+0,22
7	-1,00	-1,49	-0,84	-0,64	-0,23	-1,26	-1,04	-0,40	+0,01	-0,12
8	+0,12	+0,88	+1,05	+1,00	+0,96	+1,22	+0,92	+0,02	+0,04	+0,56
9	-0,56	+0,16	+0,65	+0,60	-0,06	-0,80	-0,90	-0,16	+0,04	+0,66
10	+1,68	+1,15	+0,40	+0,45	+0,82	+2,27	+3,55	+1,59	+1,48	+0,83
11	-0,00	-0,45	-0,63	-1,07	-0,01	-0,71	-1,45	-1,03	-0,26	-0,35
12	-0,92	+0,12	-1,14	+0,41	-0,93	-0,83	-1,03	-1,45	-1,14	-1,28
13	-0,38	-0,67	-0,02	-0,05	-0,14	+0,30	-0,04	-0,09	+0,44	+0,83
14	+0,99	+0,93	+0,05	-0,05	+0,21	+0,05	+0,92	+0,16	+0,19	+0,22
15	+0,81	+1,26	+0,90	+1,11	+0,74	+0,51	+0,92	+1,17	+0,62	-2,11
16	-0,38	-0,61	-2,02	-1,47	-1,08	+0,68	-0,63	-1,03	-1,57	-1,30
17	-0,94	-1,55	-0,77	+0,05	+1,04	+1,10	+1,55	+1,10	+1,19	+0,97
18	+0,31	-0,78	-0,63	-0,53	-0,31	-0,75	-0,13	-0,33	-0,44	-0,39
19	-1,19	+0,33	+1,94	+1,62	+2,01	-1,17	-0,31	+0,26	+2,66	+4,92
20	-0,13	+0,93	+0,90	+1,58	-0,20	-0,88	+0,10	+0,44	-0,71	-0,08

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

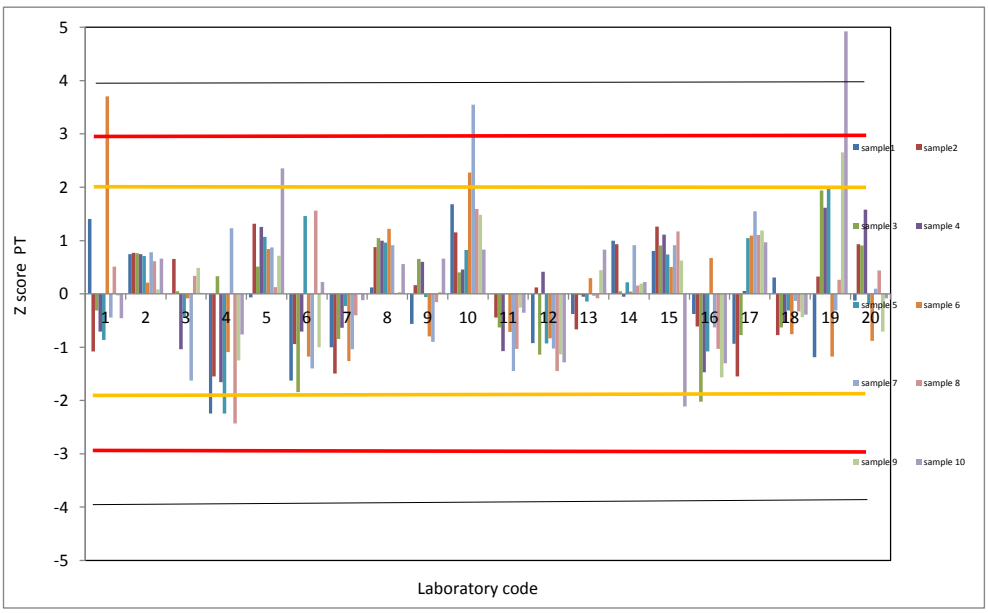


Table VII : **Zscore of the different laboratories for each sample.**
ZS calculated on the standard deviation of reproducibility of the method

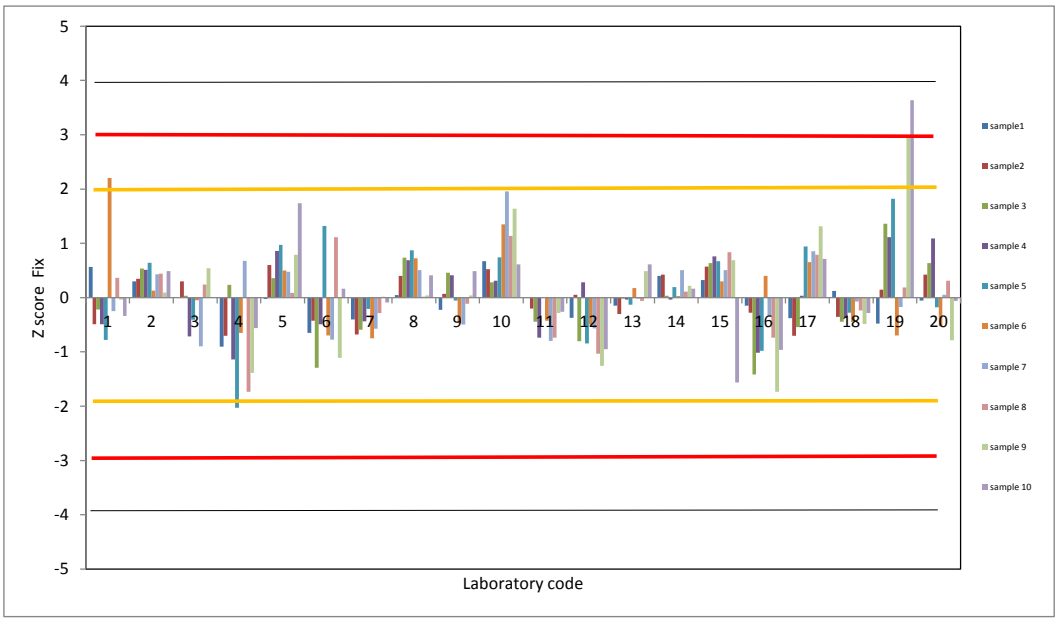
Sample / Lab code	1	2	3	4	5	6	7	8	9	10
1	+0,56	-0,49	-0,22	-0,49	-0,78	+2,20	-0,25	+0,36	-0,03	-0,34
2	+0,30	+0,35	+0,53	+0,51	+0,64	+0,13	+0,43	+0,44	+0,09	+0,49
3	-0,00	+0,30	+0,03	-0,71	-0,41	-0,05	-0,90	+0,24	+0,54	+0,01
4	-0,90	-0,70	+0,23	-1,14	-2,03	-0,65	+0,68	-1,74	-1,38	-0,56
5	-0,03	+0,60	+0,36	+0,86	+0,97	+0,50	+0,48	+0,09	+0,79	+1,74
6	-0,65	-0,43	-1,29	-0,49	+1,32	-0,70	-0,77	+1,11	-1,11	+0,16
7	-0,40	-0,68	-0,59	-0,44	-0,21	-0,75	-0,57	-0,29	+0,02	-0,09
8	+0,05	+0,40	+0,73	+0,69	+0,87	+0,73	+0,50	+0,01	+0,04	+0,41
9	-0,23	+0,07	+0,46	+0,41	-0,06	-0,47	-0,50	-0,11	+0,04	+0,49
10	+0,67	+0,52	+0,28	+0,31	+0,74	+1,35	+1,95	+1,14	+1,64	+0,61
11	-0,00	-0,20	-0,44	-0,74	-0,01	-0,42	-0,80	-0,74	-0,28	-0,26
12	-0,37	+0,05	-0,80	+0,28	-0,84	-0,50	-0,57	-1,03	-1,26	-0,95
13	-0,15	-0,30	-0,02	-0,04	-0,13	+0,18	-0,02	-0,06	+0,49	+0,61
14	+0,40	+0,42	+0,03	-0,04	+0,19	+0,03	+0,50	+0,11	+0,22	+0,16
15	+0,32	+0,57	+0,63	+0,76	+0,67	+0,30	+0,50	+0,84	+0,69	-1,56
16	-0,15	-0,28	-1,42	-1,01	-0,98	+0,40	-0,35	-0,74	-1,73	-0,96
17	-0,38	-0,70	-0,54	+0,04	+0,94	+0,65	+0,85	+0,79	+1,32	+0,71
18	+0,12	-0,35	-0,44	-0,36	-0,28	-0,45	-0,07	-0,24	-0,48	-0,29
19	-0,48	+0,15	+1,36	+1,11	+1,82	-0,70	-0,17	+0,19	+2,94	+3,64
20	-0,05	+0,42	+0,63	+1,09	-0,18	-0,52	+0,05	+0,31	-0,78	-0,06

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=0,02

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



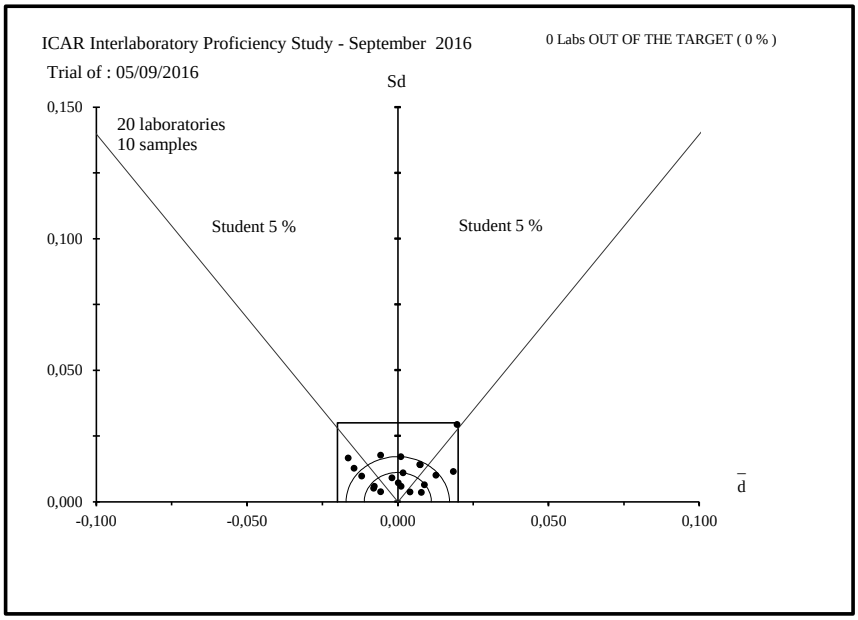


Figure 1 : ACCURACY - Evaluation of the individual performances (to see table I).

LIST OF THE PARTICIPANTS ICAR
ICAR PROFICIENCY TEST
RAW MILK
FAT CONTENT Röse Göttlieb
September 2016

Lab name	City	Country
ACTALIA	POLIGNY	FRANCE
AGROSCOPE	LIEBEFELD	SWITZERLAND
AIA-LAB. STANDARD LATTE	MACCARESE (ROMA)	ITALY
DEPARTEMENT QUALITE CRA-W	GEMBLOUX	BELGIUM
EASTERN LAB SERVICES	MEDINA	USA
ICBA - CENTRAL MILK LABORATORY	CAESAREA	ISRAEL
ILVO	MELLE	BELGIUM
JAPAN DAIRY TECHNICAL ASSOCIATION	TOKYO	JAPAN
LAB AGROAL DE SANTANDER	SANTANDER	SPAIN
LAB. OCENY MLEKA KCHZ	PARZNIEWIE	POLAND
MILCHPRUFRING BADEN-WURTTEMBERG E.V.	KIRCHEIM / TECK	GERMANY
MILKOM a.s DAIRY RESEARCH INSTITUTE	PRAHA	CZECH REPUBLIC
PIENO TYRIMAI	KAUNAS	LITHUANIA
QLIP N.V.	CM ZUTPHEN	NETHERLAND
TEAGASC FOOD RESEARCH CENTER	FERMOY CO-CORK	IRELAND
UNIV OF LJUBLJANA	DOMZALE	SLOVENIA
VALACTA	STE ANNE DE BELLEVUE	CANADA
VALIO	LAPINLAHTI	FINLAND

ICAR
PROFICIENCY TESTING SCHEME

September 2016

Raw Milk

Determination of CRUDE PROTEIN CONTENT
KJELDAHL Method

Sending date of statistical treatment : 29th september 2016

Frame of activity :	ICAR Milk Analyses Sub Committee (MA SC)	
Contact :	Gavin Scott	gavin@milktest.co.nz
ICAR Staff	Silvia Orlandini	pt@icar.org silvia@icar.org

Proficiency test accreditated ISO 17043

ACTALIA CECALAIT

cofrac COMPARAISONS INTERLABORATOIRES

ACCRÉDITATION
N° 1-2473
PORTÉE
DISPONIBLE SUR
WWW.COFRAC.FR

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

Nb	%	N°	d	Sd	D
1	5	13	+ 0,006	0,003	0,007
2	11	11	- 0,008	0,004	0,009
3	16	15	+ 0,009	0,003	0,009
4	21	10	+ 0,007	0,009	0,011
5	26	8	- 0,008	0,009	0,012
6	32	6	- 0,004	0,012	0,012
7	37	7	+ 0,004	0,012	0,013
8	42	14	- 0,011	0,007	0,013
9	47	19	+ 0,011	0,008	0,014
10	53	9	+ 0,012	0,008	0,015
11	58	17	+ 0,008	0,016	0,018
12	63	2	- 0,018	0,008	0,020
13	68	4	- 0,016	0,012	0,020
14	74	16	+ 0,019	0,011	0,022
15	79	18	- 0,020	0,009	0,022
16	84	3	+ 0,023	0,010	0,025
17	89	12	+ 0,021	0,016	0,026
18	95	5	- 0,036	0,018	0,040
19	100	1	- 0,210	0,020	0,211

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 17 laboratories using the reference method (ISO 8968 / IDF 20), after outlier discarging using Grubbs test at 5 % risk level (1)

(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.(d^2 + Sd^2))

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}	0,009
Reproducibility standard deviation of this ICAR proficiency test (after Cochran and Grubbs elimination at 5 %)	SR_{PT}	0,019

(1) SOP 1 Kjeldahl (ČSN 57 0530)

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	0,015	0,002	0,005	0,002	0,001	0,007	0,003	0,001	0,004	0,015	0,005	20
2	0,003	0,001	0,008	0,009	0,015	0,000	0,023	0,020	0,015	0,017	0,009	20
3	0,006	0,000	0,013	0,006	0,013	0,006	0,013	0,006	0,026	0,000	0,008	20
4	0,000	0,018	0,001	0,000	0,000	0,000	0,000	0,003	0,001	0,001	0,004	20
5	0,029	0,037 *	0,006	0,034	0,017	0,036	**	0,035 *	0,029	0,000	0,020	18
6	0,056 *	0,004	0,061 *	0,008	0,005	0,012	0,008	0,001	0,004	0,008	0,019	20
7	0,007	0,008	0,001	0,003	0,009	0,007	0,022	0,006	0,012	0,003	0,007	20
8	0,004	0,022	0,007	0,021	0,002	0,034	0,010	0,005	0,004	0,013	0,011	20
9	0,010	0,004	0,010	0,003	0,016	0,003	0,001	0,006	0,004	0,008	0,005	20
10	0,002	0,006	0,008	0,004	0,005	0,022	0,001	0,010	0,003	0,003	0,006	20
11	0,006	0,001	0,004	0,003	0,003	0,004	0,002	0,010	0,009	0,003	0,004	20
12	0,007	0,021	0,014	**	0,001	0,006	0,002	**	0,014	0,032	0,011	16
13	0,006	0,006	0,000	0,006	0,013	0,006	0,006	0,000	0,000	0,006	0,005	20
14	0,012	0,007	0,005	0,001	0,009	0,034	0,004	0,005	0,001	0,007	0,009	20
15	0,002	0,004	0,004	0,001	0,005	0,002	0,002	0,010	0,004	0,000	0,003	20
16	0,010	0,010	0,006	0,011	0,020	0,005	0,001	0,003	0,001	0,029	0,009	20
17	0,010	0,008	0,013	0,002	0,014	0,014	0,017	0,006	0,007	0,014	0,008	20
18	0,029	0,014	0,015	0,028	0,012	0,005	0,003	0,004	0,034	0,018	0,014	20
19	0,020	0,012	0,004	0,011	0,004	0,007	0,005	0,015	0,005	0,024	0,009	20
Sr	0,013	0,009	0,011	0,009	0,007	0,011	0,007	0,008	0,009	0,010		374
NE	38	38	38	36	38	38	36	36	38	38		
L	0,036	0,029	0,022	0,035	0,029	0,044	0,027	0,022	0,037	0,039		

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 betwen two replicates=0,038 according ISO 8968 / IDF 20

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

Sample / Lab code	1	2	3	4	5	6	7	8	9	10
1	2,578 *	2,696 *	3,056 *	3,340 *	3,559 *	3,105 *	2,607 *	2,881 *	3,237 *	3,453 *
2	2,719	2,907	3,271	3,543	3,747	3,288	2,803	3,078	3,428	3,643
3	2,766	2,941	3,305	3,595	3,802	3,327	2,833	3,110	3,483	3,675
4	2,708	2,884	3,265	3,539	3,734	3,319	2,818	3,081	3,459	3,644
5	2,668 *	2,881	3,242	3,532	3,739	3,268		3,070	3,458	3,607
6	2,738	2,909	3,302	3,549	3,750	3,320	2,815	3,077	3,447	3,665
7	2,731	2,921	3,278	3,575	3,767	3,313	2,803	3,096	3,472	3,690
8	2,734	2,904	3,275	3,553	3,763	3,291	2,825	3,092	3,444	3,651
9	2,742	2,929	3,298	3,579	3,782	3,312	2,820	3,114	3,483	3,672
10	2,731	2,927	3,292	3,564	3,771	3,311	2,845	3,098	3,463	3,676
11	2,725	2,901	3,272	3,553	3,756	3,307	2,823	3,088	3,455	3,654
12	2,754	2,933	3,314		3,796	3,351	2,805		3,486	3,685
13	2,740	2,919	3,292	3,570	3,764	3,321	2,830	3,101	3,471	3,665
14	2,713	2,906	3,270	3,550	3,743	3,314	2,810	3,086	3,461	3,652
15	2,737	2,922	3,289	3,573	3,772	3,325	2,832	3,103	3,474	3,670
16	2,740	2,920	3,301	3,569	3,795	3,332	2,839	3,114	3,480	3,706
17	2,753	2,938	3,299	3,551	3,773	3,290	2,817	3,107	3,482	3,682
18	2,712	2,888	3,255	3,555	3,743	3,298	2,807	3,081	3,429	3,638
19	2,749	2,936	3,286	3,563	3,784	3,338	2,821	3,104	3,474	3,668
M	2,735	2,915	3,284	3,560	3,766	3,313	2,820	3,094	3,464	3,663
REF.	2,733	2,914	3,283	3,560	3,765	3,314	2,820	3,093	3,464	3,663
SD	0,016	0,018	0,019	0,016	0,021	0,020	0,013	0,014	0,018	0,023

M = mean per sample
SD = standard deviation per sample
REF. = reference values
*: 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 17 laboratories using the reference method ISO 8968 / IDF 20, after outliers discarging using Grubbs test at 5 % risk level.

Table IV : Outlier identification

Sample	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Outliers Cochran	6	5	6					5		
Outlier Grubbs	1;5	1	1	1	1	1	1	1	1	1
sr	0,008	0,008	0,006	0,009	0,008	0,011	0,007	0,006	0,010	0,010
SR	0,017	0,018	0,019	0,017	0,021	0,022	0,014	0,014	0,019	0,024

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	- 0,156	- 0,218	- 0,228	- 0,220	- 0,207	- 0,210	- 0,214	- 0,213	- 0,227	- 0,211	- 0,210	0,020	32,67
2	- 0,015	- 0,006	- 0,012	- 0,016	- 0,018	- 0,026	- 0,017	- 0,015	- 0,036	- 0,020	- 0,018	0,008	7,12
3	+ 0,033	+ 0,028	+ 0,022	+ 0,036	+ 0,037	+ 0,013	+ 0,012	+ 0,017	+ 0,020	+ 0,012	+ 0,023	0,010	7,34
4	- 0,025	- 0,030	- 0,019	- 0,021	- 0,031	+ 0,005	- 0,002	- 0,013	- 0,005	- 0,020	- 0,016	0,012	4,27
5	- 0,065	- 0,033	- 0,042	- 0,028	- 0,026	- 0,046		- 0,024	- 0,005	- 0,057	- 0,036	0,018	5,92
6	+ 0,005	- 0,004	+ 0,019	- 0,011	- 0,016	+ 0,006	- 0,005	- 0,017	- 0,017	+ 0,002	- 0,004	0,012	1,00
7	- 0,002	+ 0,007	- 0,006	+ 0,015	+ 0,002	- 0,002	- 0,017	+ 0,002	+ 0,009	+ 0,027	+ 0,004	0,012	0,92
8	+ 0,000	- 0,010	- 0,009	- 0,006	- 0,002	- 0,023	+ 0,005	- 0,002	- 0,020	- 0,013	- 0,008	0,009	2,80
9	+ 0,009	+ 0,016	+ 0,014	+ 0,020	+ 0,017	- 0,003	- 0,000	+ 0,021	+ 0,019	+ 0,009	+ 0,012	0,008	4,63
10	- 0,002	+ 0,013	+ 0,009	+ 0,004	+ 0,006	- 0,004	+ 0,025	+ 0,005	- 0,000	+ 0,012	+ 0,007	0,009	2,49
11	- 0,008	- 0,012	- 0,011	- 0,007	- 0,009	- 0,007	+ 0,003	- 0,005	- 0,009	- 0,010	- 0,008	0,004	5,60
12	+ 0,021	+ 0,019	+ 0,031		+ 0,031	+ 0,036	- 0,015		+ 0,022	+ 0,022	+ 0,021	0,016	3,75
13	+ 0,007	+ 0,005	+ 0,009	+ 0,010	- 0,001	+ 0,006	+ 0,009	+ 0,007	+ 0,007	+ 0,002	+ 0,006	0,003	5,92
14	- 0,020	- 0,008	- 0,013	- 0,009	- 0,023	- 0,000	- 0,011	- 0,007	- 0,003	- 0,012	- 0,011	0,007	4,89
15	+ 0,004	+ 0,008	+ 0,005	+ 0,014	+ 0,007	+ 0,010	+ 0,012	+ 0,010	+ 0,011	+ 0,007	+ 0,009	0,003	9,32
16	+ 0,006	+ 0,007	+ 0,017	+ 0,009	+ 0,030	+ 0,018	+ 0,018	+ 0,021	+ 0,016	+ 0,043	+ 0,019	0,011	5,30
17	+ 0,020	+ 0,024	+ 0,016	- 0,008	+ 0,007	- 0,025	- 0,003	+ 0,014	+ 0,019	+ 0,019	+ 0,008	0,016	1,67
18	- 0,022	- 0,025	- 0,028	- 0,005	- 0,022	- 0,016	- 0,014	- 0,012	- 0,035	- 0,025	- 0,020	0,009	7,37
19	+ 0,016	+ 0,022	+ 0,003	+ 0,003	+ 0,019	+ 0,023	+ 0,001	+ 0,011	+ 0,010	+ 0,005	+ 0,011	0,008	4,30
d	+ 0,002	+ 0,001	+ 0,000	- 0,000	+ 0,000	- 0,002	+ 0,000	+ 0,001	+ 0,000	+ 0,000	- 0,011	0,051	
Sd	0,016	0,018	0,019	0,016	0,021	0,020	0,013	0,014	0,018	0,023	0,018		

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

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

ISO 8968 / IDF 20 : 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	-9,70	-11,82	-11,97	-13,67	-9,94	-10,50	-16,95	-15,26	-12,57	-9,23
2	-0,92	-0,34	-0,64	-1,01	-0,89	-1,31	-1,35	-1,09	-2,00	-0,88
3	+2,02	+1,50	+1,13	+2,21	+1,80	+0,64	+0,98	+1,22	+1,10	+0,51
4	-1,57	-1,61	-0,99	-1,28	-1,49	+0,23	-0,19	-0,92	-0,29	-0,86
5	-4,05	-1,79	-2,18	-1,74	-1,24	-2,32		-1,69	-0,30	-2,48
6	+0,32	-0,23	+0,98	-0,69	-0,75	+0,30	-0,41	-1,18	-0,92	+0,09
7	-0,14	+0,39	-0,29	+0,94	+0,08	-0,08	-1,37	+0,17	+0,48	+1,19
8	+0,02	-0,53	-0,46	-0,39	-0,09	-1,17	+0,37	-0,11	-1,09	-0,55
9	+0,55	+0,86	+0,75	+1,24	+0,83	-0,15	-0,01	+1,52	+1,08	+0,40
10	-0,14	+0,72	+0,46	+0,25	+0,27	-0,18	+1,99	+0,35	-0,02	+0,54
11	-0,50	-0,67	-0,59	-0,43	-0,44	-0,35	+0,24	-0,38	-0,49	-0,42
12	+1,32	+1,05	+1,64		+1,50	+1,82	-1,21		+1,25	+0,96
13	+0,44	+0,29	+0,46	+0,62	-0,04	+0,32	+0,72	+0,53	+0,39	+0,09
14	-1,25	-0,42	-0,71	-0,57	-1,08	-0,02	-0,84	-0,52	-0,17	-0,51
15	+0,26	+0,44	+0,28	+0,84	+0,33	+0,52	+0,95	+0,72	+0,59	+0,32
16	+0,40	+0,37	+0,92	+0,56	+1,43	+0,89	+1,46	+1,49	+0,89	+1,87
17	+1,24	+1,30	+0,83	-0,51	+0,36	-1,24	-0,24	+1,00	+1,03	+0,82
18	-1,35	-1,38	-1,46	-0,29	-1,07	-0,80	-1,10	-0,89	-1,93	-1,11
19	+0,99	+1,20	+0,15	+0,21	+0,91	+1,16	+0,07	+0,78	+0,57	+0,22

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

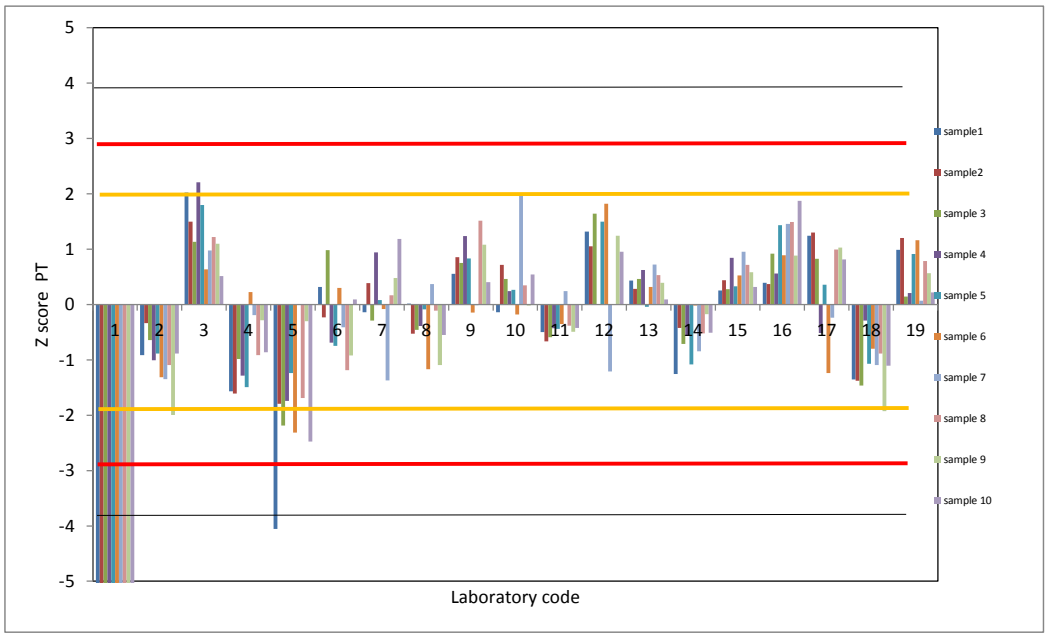


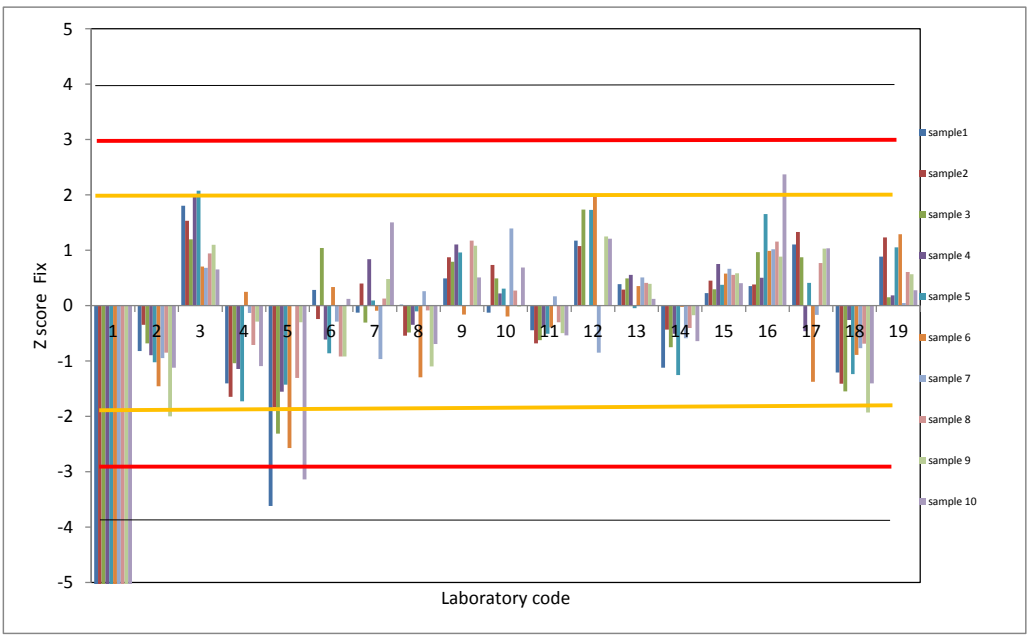
Table VII : **Zscore of the different laboratories for each sample.**
ZS calculated on the standard deviation of reproducibility of the method

Sample/Lab code	1	2	3	4	5	6	7	8	9	10
1	-8,65	-12,09	-12,65	-12,20	-11,48	-11,66	-11,88	-11,82	-12,59	-11,70
2	-0,82	-0,35	-0,68	-0,90	-1,02	-1,46	-0,95	-0,85	-2,00	-1,12
3	+1,81	+1,53	+1,20	+1,97	+2,08	+0,71	+0,68	+0,94	+1,10	+0,65
4	-1,40	-1,64	-1,04	-1,14	-1,73	+0,25	-0,13	-0,71	-0,29	-1,09
5	-3,62	-1,83	-2,31	-1,55	-1,43	-2,57		-1,31	-0,30	-3,14
6	+0,28	-0,24	+1,04	-0,61	-0,86	+0,33	-0,29	-0,92	-0,92	+0,12
7	-0,13	+0,40	-0,31	+0,84	+0,09	-0,09	-0,96	+0,13	+0,48	+1,50
8	+0,02	-0,54	-0,48	-0,35	-0,10	-1,30	+0,26	-0,08	-1,10	-0,69
9	+0,49	+0,88	+0,79	+1,11	+0,96	-0,16	-0,01	+1,17	+1,08	+0,51
10	-0,13	+0,74	+0,49	+0,22	+0,31	-0,20	+1,39	+0,27	-0,02	+0,69
11	-0,44	-0,68	-0,63	-0,38	-0,51	-0,39	+0,17	-0,30	-0,49	-0,54
12	+1,18	+1,07	+1,73		+1,73	+2,02	-0,85		+1,25	+1,21
13	+0,39	+0,29	+0,49	+0,56	-0,05	+0,35	+0,51	+0,41	+0,39	+0,12
14	-1,12	-0,43	-0,75	-0,51	-1,25	-0,02	-0,59	-0,40	-0,18	-0,64
15	+0,23	+0,45	+0,30	+0,75	+0,38	+0,58	+0,67	+0,55	+0,59	+0,40
16	+0,35	+0,38	+0,97	+0,50	+1,65	+0,99	+1,02	+1,16	+0,89	+2,37
17	+1,11	+1,33	+0,87	-0,46	+0,41	-1,37	-0,17	+0,77	+1,03	+1,03
18	-1,21	-1,41	-1,55	-0,26	-1,23	-0,89	-0,77	-0,69	-1,93	-1,40
19	+0,88	+1,23	+0,15	+0,18	+1,05	+1,29	+0,05	+0,61	+0,57	+0,28

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



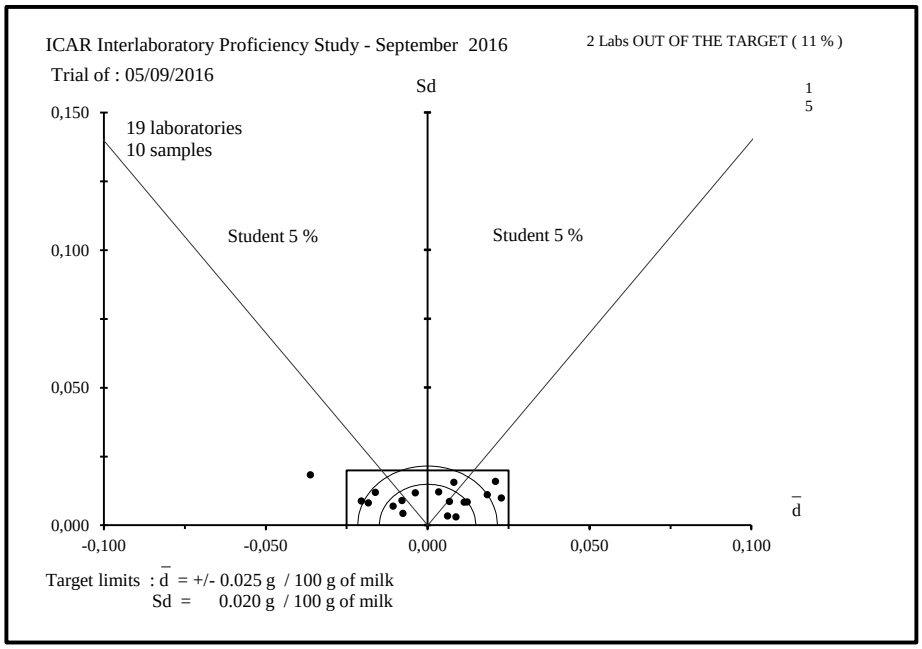


Figure 1 : ACCURACY - Evaluation of the individual performances (to see table I).

LIST OF THE PARTICIPANTS ICAR
ICAR PROFICIENCY TEST
RAW MILK
NITROGEN CONTENT
September 2016

Name	City	Country
ACTALIA-Cecalait	POLIGNY	FRANCE
AGROSCOPE	LIEBEFELD	SWITZERLAND
AIA-LAB. STANDARD LATTE	MACCARESE (ROMA)	ITALY
CENTRAL MILK LABORATORY - ICBA	CAESAREA	ISRAEL
DEPARTEMENT QUALITE CRA-W	GEMBLOUX	BELGIUM
EASTERN LAB SERVICES	MEDINA	USA
ILVO - T.V.	MELLE	BELGIUM
JAPAN DAIRY TECHNICAL ASSOCIATION	TOKYO	JAPAN
LAB AGROAL DE SANTANDER	SANTANDER	SPAIN
LOM KCHZ LABORATORIM REFERENCYJNE	PRUSZKOW	POLAND
MILCHPRUFRING BADEN-WURTTEMBERG E.V.	KIRCHEIM / TECK	GERMANY
MILKOM a.s. DAIRY RESEARCH INSTITUTE	PRAHA	CZECH REPUBLIC
PiENO TYRIMAI	KAUNAS	LITHUANIA
QLIP N.V.	CM ZUTPHEN	NETHERLAND
TEAGASC FOOD RESEARCH CENTER	FERMOY CO-CORK	IRELAND
UNIVERSITY OF LJUBLIANA	DOMZALE	SLOVENIA
VALACTA	STE ANNE DE BELLEVUE	CANADA
VALIO	LAPINLAHTI	FINLAND

ICAR
PROFICIENCY TESTING SCHEME

September 2016

Raw Milk

Determination of LACTOSE CONTENT

Sending date of statistical treatment : 29th september 2016

Frame of activity :	ICAR Milk Analyses Sub Committee (MA SC)	
Contact :	Gavin Scott	gavin@milktest.co.nz
ICAR Staff	Silvia Orlandini	pt@icar.org silvia@icar.org

ACTALIA CECALAIT

cofrac COMPARAISONS INTERLABORATOIRES

ACCRÉDITATION N° 1-2473 PORTÉE DISPONIBLE SUR WWW.COFRAC.FR

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

Nb	%	N°	d	Sd	D	Method
1	7	2	- 0,004	0,014	0,014	HPLC
2	14	8	- 0,012	0,017	0,021	Enzymatic
3	21	7	- 0,016	0,017	0,023	HPLC
4	29	9	+ 0,018	0,020	0,027	Enzymatic
5	36	13	+ 0,041	0,014	0,043	Enzymatic
6	43	12	+ 0,030	0,032	0,044	HPLC
7	50	11	- 0,027	0,054	0,060	Continuous flow analyzer
8	57	4	- 0,037	0,055	0,066	Enzymatic Test Kit from Roche
9	64	10	- 0,070	0,028	0,075	Lane-Eynon method
10	71	3	+ 0,077	0,020	0,080	Polarimeter
11	79	14	+ 0,095	0,022	0,098	HPLC
12	86	5	- 0,127	0,032	0,131	Enzymatic
13	93	1	- 0,054	0,130	0,141	Enzymatic
14	100	6	+ 0,068	0,145	0,160	HPLC

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 :

+/- 0.100 g / 100 g for $\bar{d}$ and 0.100 g / 100g for Sd

REF : Assigned values are robust average values per sample according to algorithm A of standard ISO 13528, of 14 laboratories , after outliers discarging 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.(d^2 + Sd^2))

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}	0,014
Reproducibility standard deviation of this ICAR proficiency test (after Cochran and Grubbs elimination at 5 %)	SR_{PT}	0,069

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	0,010	0,010	0,000	0,010	0,000	0,010	0,000	0,010	0,010	0,000	0,005	20
2	0,007	0,005	0,004	0,006	0,006	0,016	0,003	0,000	0,008	0,011	0,006	20
3	0,000	0,000	0,000	0,010	0,000	0,000	0,000	0,010	0,010	0,000	0,004	20
4	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	20
5	0,017	0,005	0,020	0,012	0,054	0,028	0,043	0,001	0,003	0,006	0,018	20
6	0,029	0,030	0,009	0,047 *	0,058	0,011	0,013	0,010	0,017	0,019	0,021	20
7	0,005	0,000	0,001	0,001	0,000	0,011	0,006	0,006	0,026	0,002	0,007	20
8	0,010	0,029	0,008	0,009	0,016	0,032	0,019	0,022	0,001	0,012	0,013	20
9	0,020	0,027	0,014	0,022	0,024	0,018	0,006	0,028	0,017	0,002	0,014	20
10	0,002	0,001	0,002	0,003	0,009	0,012	0,013	0,005	0,012	0,022	0,007	20
11	0,059 *	0,048	0,068 *	0,107 *	0,019	0,049	0,068 *	0,010	0,184 *	0,017	0,056	20
12	0,000	0,016	0,019	0,015	0,020	0,014	0,007	0,009	0,035	0,014	0,012	20
13	0,033	0,013	0,034	0,026	0,031	0,056	0,031	0,019	0,014	0,006	0,021	20
14	0,010	0,033	0,014	0,000	0,010	0,009	0,003	0,021	0,049	0,030	0,016	20
Sr	0,015	0,015	0,016	0,024	0,018	0,018	0,017	0,010	0,037	0,010		280
NE	28	28	28	28	28	28	28	28	28	28		
L	0,039	0,056	0,035	0,032	0,067	0,065	0,043	0,036	0,053	0,036		

Sr : repeatability standard deviation of each laboratory limit 0,022 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 betwen two replicates=0,06 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
1	4,795	4,795 *	4,750	4,725	4,700	4,865	4,820	4,785	4,745 *	4,710
2	4,868	5,070	4,720	4,687	4,766	4,780	4,733	4,929	4,994	4,651
3	4,960	5,170	4,800	4,765	4,840	4,870	4,800	5,015	5,085	4,700
4	4,812	5,151	4,581	4,630	4,678	4,786	4,692	4,890	4,990	4,656
5	4,696	4,908	4,597	4,590	4,651	4,645	4,614	4,807	4,891	4,565
6	4,872	5,109	4,727	4,716	4,811	4,925	5,008 *	4,785	4,945	5,023 *
7	4,869	5,041	4,691	4,674	4,745	4,775	4,719	4,918	4,992	4,653
8	4,871	5,083	4,719	4,691	4,744	4,781	4,715	4,916	4,970	4,623
9	4,864	5,068	4,733	4,730	4,786	4,815	4,753	4,957	5,013	4,695
10	4,819	4,980	4,659	4,601	4,708	4,692	4,653	4,877	4,948	4,603
11	4,923	5,097	4,766	4,567	4,714	4,806	4,694	4,869	4,942	4,587
12	4,885	5,044	4,738	4,715	4,815	4,845	4,783	4,989	5,003	4,716
13	4,898	5,102	4,760	4,731	4,808	4,836	4,778	4,973	5,042	4,717
14	4,987	5,176	4,790	4,758	4,890	4,902	4,805	5,020	5,108	4,753
M	4,865	5,077	4,716	4,684	4,761	4,809	4,735	4,909	4,994	4,664
REF.	4,869	5,082	4,723	4,685	4,760	4,813	4,737	4,909	4,993	4,664
SD	0,072	0,075	0,065	0,064	0,068	0,076	0,062	0,079	0,060	0,057

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, after outliers discarging using Grubbs test at 5 % risk level.

Table IV : Outlier identification

Sample	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Outliers Cochran	11		11	6;11			11		11	
Outlier Grubbs		2					6			6
sr	0,011	0,016	0,010	0,009	0,018	0,018	0,012	0,010	0,015	0,009
SR	0,073	0,075	0,067	0,058	0,069	0,077	0,064	0,079	0,061	0,058

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	- 0,074	- 0,287	+ 0,027	+ 0,040	- 0,060	+ 0,052	+ 0,083	- 0,124	- 0,248	+ 0,046	- 0,054	0,130	1,32
2	- 0,002	- 0,012	- 0,003	+ 0,002	+ 0,006	- 0,033	- 0,004	+ 0,020	+ 0,001	- 0,013	- 0,004	0,014	0,87
3	+ 0,091	+ 0,088	+ 0,077	+ 0,080	+ 0,080	+ 0,057	+ 0,063	+ 0,106	+ 0,092	+ 0,036	+ 0,077	0,020	12,09
4	- 0,057	+ 0,069	- 0,142	- 0,055	- 0,082	- 0,027	- 0,045	- 0,019	- 0,003	- 0,008	- 0,037	0,055	2,11
5	- 0,174	- 0,174	- 0,126	- 0,095	- 0,109	- 0,168	- 0,123	- 0,103	- 0,102	- 0,099	- 0,127	0,032	12,40
6	+ 0,002	+ 0,027	+ 0,004	+ 0,031	+ 0,051	+ 0,111	+ 0,271	- 0,124	- 0,048	+ 0,359	+ 0,068	0,145	1,49
7	- 0,001	- 0,041	- 0,032	- 0,011	- 0,015	- 0,039	- 0,018	+ 0,009	- 0,001	- 0,011	- 0,016	0,017	3,02
8	+ 0,002	+ 0,001	- 0,004	+ 0,006	- 0,016	- 0,032	- 0,022	+ 0,007	- 0,023	- 0,041	- 0,012	0,017	2,31
9	- 0,005	- 0,014	+ 0,010	+ 0,045	+ 0,026	+ 0,002	+ 0,016	+ 0,048	+ 0,020	+ 0,031	+ 0,018	0,020	2,76
10	- 0,050	- 0,102	- 0,064	- 0,084	- 0,052	- 0,121	- 0,084	- 0,033	- 0,045	- 0,061	- 0,070	0,028	7,95
11	+ 0,053	+ 0,015	+ 0,043	- 0,118	- 0,046	- 0,008	- 0,043	- 0,040	- 0,051	- 0,077	- 0,027	0,054	1,61
12	+ 0,016	- 0,038	+ 0,015	+ 0,030	+ 0,055	+ 0,032	+ 0,046	+ 0,079	+ 0,010	+ 0,052	+ 0,030	0,032	2,92
13	+ 0,028	+ 0,021	+ 0,037	+ 0,046	+ 0,048	+ 0,022	+ 0,041	+ 0,064	+ 0,049	+ 0,053	+ 0,041	0,014	9,27
14	+ 0,118	+ 0,094	+ 0,067	+ 0,073	+ 0,130	+ 0,088	+ 0,068	+ 0,110	+ 0,115	+ 0,089	+ 0,095	0,022	13,52
d	- 0,004	- 0,005	- 0,006	- 0,001	+ 0,001	- 0,004	- 0,002	+ 0,000	+ 0,001	- 0,000	- 0,001	0,082	
Sd	0,072	0,075	0,065	0,064	0,068	0,076	0,062	0,079	0,060	0,057	0,068		

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

Upper limits : $\bar{d}$ = +/- 0.100 g / 100g 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

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	-1,03	-3,85	+0,42	+0,63	-0,88	+0,68	+1,33	-1,57	-4,17	+0,81
2	-0,03	-0,16	-0,04	+0,03	+0,09	-0,44	-0,07	+0,25	+0,02	-0,23
3	+1,26	+1,18	+1,19	+1,26	+1,19	+0,75	+1,01	+1,34	+1,55	+0,63
4	-0,80	+0,93	-2,17	-0,86	-1,21	-0,36	-0,72	-0,24	-0,05	-0,14
5	-2,42	-2,34	-1,93	-1,49	-1,61	-2,22	-1,98	-1,30	-1,72	-1,72
6	+0,03	+0,37	+0,06	+0,48	+0,76	+1,47	+4,35	-1,57	-0,81	+6,26
7	-0,01	-0,55	-0,49	-0,18	-0,22	-0,51	-0,29	+0,11	-0,02	-0,19
8	+0,02	+0,01	-0,06	+0,09	-0,23	-0,42	-0,36	+0,09	-0,39	-0,71
9	-0,08	-0,19	+0,16	+0,71	+0,39	+0,03	+0,26	+0,61	+0,33	+0,54
10	-0,70	-1,37	-0,98	-1,33	-0,77	-1,60	-1,36	-0,41	-0,75	-1,06
11	+0,74	+0,20	+0,66	-1,86	-0,68	-0,10	-0,69	-0,51	-0,86	-1,35
12	+0,22	-0,51	+0,23	+0,46	+0,82	+0,42	+0,73	+1,00	+0,16	+0,91
13	+0,39	+0,28	+0,57	+0,72	+0,71	+0,30	+0,66	+0,81	+0,83	+0,93
14	+1,63	+1,26	+1,03	+1,15	+1,93	+1,17	+1,09	+1,40	+1,93	+1,56

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

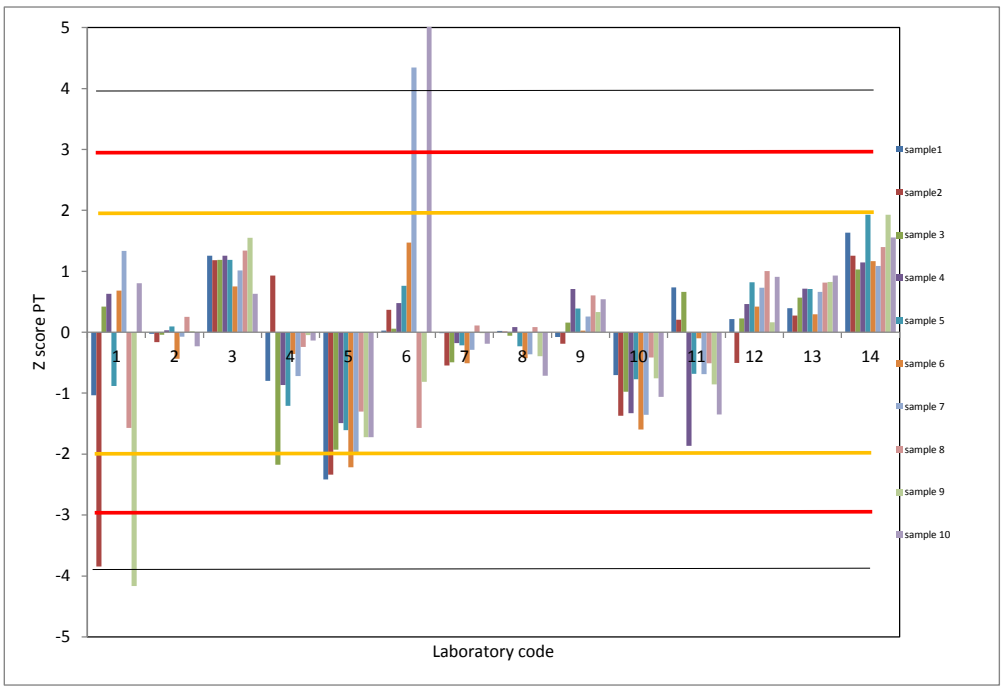


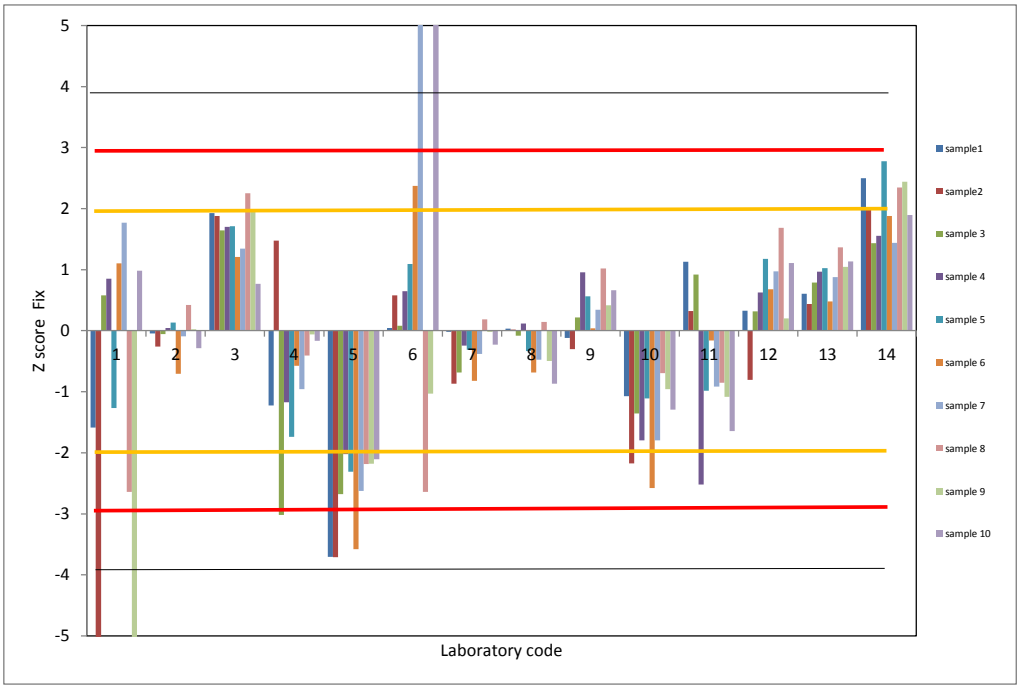
Table VII : **Zscore of the different laboratories for each sample.**
ZS calculated on the standard deviation of reproducibility of the method

Sample / Lab code	1	2	3	4	5	6	7	8	9	10
1	-1,58	-6,10	+0,58	+0,85	-1,27	+1,10	+1,77	-2,64	-5,27	+0,98
2	-0,04	-0,26	-0,06	+0,04	+0,14	-0,70	-0,09	+0,42	+0,02	-0,28
3	+1,93	+1,88	+1,64	+1,70	+1,71	+1,21	+1,34	+2,25	+1,96	+0,77
4	-1,22	+1,47	-3,02	-1,17	-1,74	-0,58	-0,96	-0,41	-0,06	-0,17
5	-3,70	-3,71	-2,67	-2,02	-2,31	-3,58	-2,63	-2,18	-2,18	-2,10
6	+0,04	+0,58	+0,08	+0,65	+1,09	+2,37	+5,76	-2,64	-1,03	+7,63
7	-0,02	-0,87	-0,69	-0,24	-0,31	-0,82	-0,38	+0,19	-0,02	-0,23
8	+0,03	+0,02	-0,08	+0,12	-0,33	-0,68	-0,48	+0,15	-0,50	-0,87
9	-0,12	-0,30	+0,22	+0,96	+0,56	+0,04	+0,34	+1,02	+0,42	+0,66
10	-1,07	-2,18	-1,36	-1,80	-1,11	-2,58	-1,80	-0,70	-0,96	-1,29
11	+1,13	+0,32	+0,92	-2,52	-0,98	-0,16	-0,91	-0,85	-1,08	-1,65
12	+0,33	-0,80	+0,31	+0,63	+1,18	+0,68	+0,97	+1,69	+0,20	+1,11
13	+0,60	+0,44	+0,79	+0,97	+1,02	+0,48	+0,88	+1,37	+1,04	+1,14
14	+2,50	+1,99	+1,43	+1,55	+2,77	+1,88	+1,44	+2,35	+2,44	+1,90

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=0,047

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



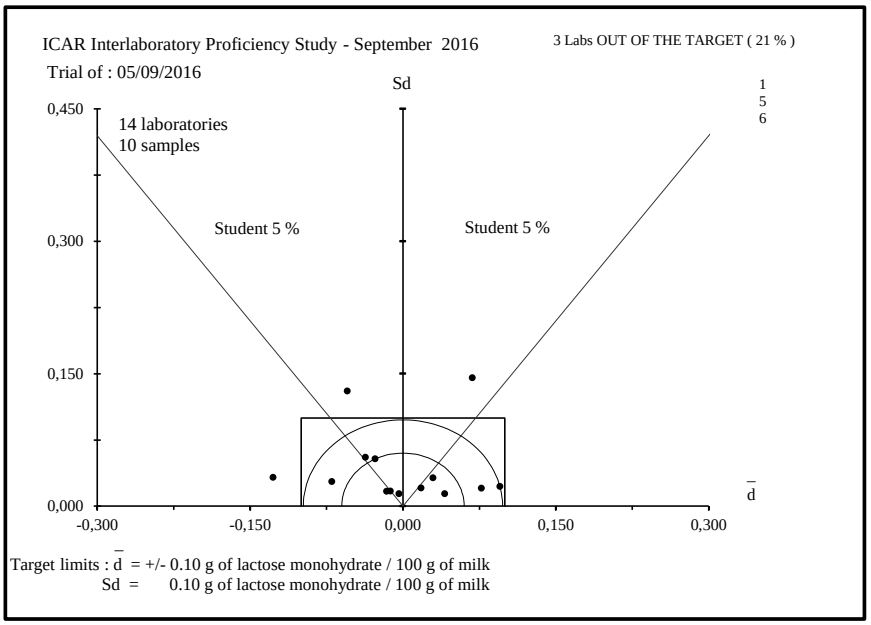


Figure 1 : ACCURACY - Evaluation of the individual performances (to see table I).

LIST OF THE PARTICIPANTS ICAR
ICAR PROFICIENCY TEST
RAW MILK
LACTOSE CONTENT
September 2016

Name	City	Country
AGROSCOPE	LIEBEFELD	SWITZERLAND
AIA-LAB. STANDARD LATTE	MACCARESE (ROMA)	ITALY
DEPARTEMENT QUALITE CRA-W	GEMBLOUX	BELGIUM
EASTERN LAB SERVICES	MEDINA	USA
JAPAN DAIRY TECHNICAL ASSOCIATION	TOKYO	JAPAN
LAB AGROAL DE SANTANDER	SANTANDER	SPAIN
LOM KCHZ LABORATORIM REFERENCYJNE	PRUSZKOW	POLAND
MILCHPRUFRING BADEN-WURTTEMBERG E.V.	KIRCHEIM / TECK	GERMANY
MILK TEST	HAMILTON	NEW ZEALAND
PYENO TYRIMAI	KAUNAS	LITHUANIA
QLIP N.V.	CM ZUTPHEN	NETHERLAND
TEAGASC FOOD RESEARCH CENTER	FERMOY CO-CORK	IRELAND
UNIVERSITY OF LJUBLIANA	DOMZALE	SLOVENIA
VALACTA	STE ANNE DE BELLEVUE	CANADA

ICAR
PROFICIENCY TESTING SCHEME

September 2016

Raw Milk

Determination of UREA CONTENT

Sending date of statistical treatment : 29th september 2016

Frame of activity :	ICAR Milk Analyses Sub Committee (MA SC)	
Contact :	Gavin Scott	gavin@milktest.co.nz
ICAR Staff	Silvia Orlandini	pt@icar.org silvia@icar.org

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

Nb	%	N°	d	Sd	D	**Method**
1	8	2	+ 0,16	0,26	0,31	diff.pH
2	15	3	- 0,12	0,37	0,39	(1)
3	23	1	+ 0,16	0,37	0,41	diff.pH
4	31	13	- 0,12	0,40	0,41	diff.pH
5	38	5	- 0,03	0,57	0,57	diff.pH
6	46	11	- 0,74	0,63	0,97	diff.pH
7	54	10	+ 0,81	0,56	0,99	diff.pH
8	62	9	+ 0,12	1,09	1,10	(2)
9	69	8	- 1,79	0,29	1,82	diff.pH
10	77	12	+ 1,56	1,26	2,00	diff.pH
11	85	7	- 2,21	0,23	2,22	diff.pH
12	92	6	+ 1,60	1,61	2,27	(3)
13	100	4	+ 2,34	0,59	2,42	diff.pH

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 :

+/- 2,50 mg / 100 g for $\bar{d}$ and 1,50 mg / 100 g for Sd

REF : Assigned values are robust average values per sample according to algorithm A of standard ISO 13528, of 10 laboratories using reference method (ISO 14637/IDF 195), after outlier discarging 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.(d^2 + Sd^2))

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}	0,50
Reproducibility standard deviation of this ICAR proficiency test (after Cochran and Grubbs elimination at 5 %)	SR_{PT}	1,51

(1) home method based on AFNOR NF04-217 (DIN 10484 : 2013)
(2) Continuous flow analyzer
(3) Continuous flow analyzer

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

Sample / Lab code	1	2	3	4	5	6	7	8	9	10	Sr	NL
1	0,21	0,00	0,00	0,21	0,21	0,00	0,00	0,00	0,00	0,00	0,08	20
2	0,80	0,80	0,30	0,50	0,70	0,70	0,10	0,10	0,80	0,10	0,40	20
3	0,80	0,60	1,00	0,80	1,40	1,00	1,10	0,70	0,70	1,20	0,68	20
4	1,00	0,00	0,00	1,00	0,00	0,00	0,00	0,00	0,00	1,00	0,39	20
5	0,70	0,90	0,10	1,10	1,10	1,10	0,50	1,60 *	1,80	0,20	0,74	20
6	0,70	0,50	0,80	0,30	1,00	0,40	0,80	0,30	0,60	0,10	0,43	20
7	1,00	0,00	0,50	0,20	0,60	0,20	0,20	0,10	0,00	0,50	0,32	20
8	0,40	1,20	0,70	0,30	0,00	0,30	0,10	0,10	1,00	1,00	0,46	20
9	1,30	0,60	0,80	0,80	0,10	0,40	0,90	0,40	0,10	0,20	0,48	20
10	0,60	0,60	0,20	0,00	0,20	0,20	0,90	0,10	0,70	1,30	0,44	20
11	0,50	0,27	1,07	1,07	0,33	1,34	1,44	0,47	0,37	0,23	0,59	20
12	0,70	0,30	1,40	0,20	0,00	0,10	0,80	0,50	2,30	0,20	0,66	20
13	0,30	1,00	0,90	0,90	0,90	0,10	0,50	0,00	0,70	0,50	0,48	20
Sr	0,53	0,45	0,52	0,48	0,48	0,44	0,51	0,38	0,68	0,47		260
NE	26	26	26	26	26	26	26	26	26	26		
L	1,95	1,66	1,91	1,76	1,76	1,61	1,86	0,82	2,50	1,73		

Sr : repeatability standard deviation of each laboratory limit 0,54 mg/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 betwen two replicates=1,50 according ISO 14637 / IDF 195

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

Sample / Lab Code	1	2	3	4	5	6	7	8	9	10
1	64,52	60,13	54,57	50,83	46,55	41,94	37,24	31,89	26,75	22,26
2	64,40	59,80	54,75	50,55	46,25	41,95	37,25	31,85	27,10	22,75
3	64,40	59,10	55,20	50,50	46,00	41,60	36,95	31,65	26,75	21,70
4	66,50	62,00	58,00	53,50	49,00	44,00	38,00	34,00	29,00	24,50
5	65,05	58,75	54,95	49,95	46,95	41,15	36,75	32,10	26,50	22,60
6	67,45	62,75	58,40	52,85	48,20	43,40	37,90	31,45	26,50	22,15
7	61,60	57,50	52,45	48,50	44,00	39,50	34,70	29,45	25,00	20,25
8	62,10	57,90	53,65	49,05	44,50	39,55	35,15	29,75	25,30	20,20
9	66,05	61,00	56,00	50,90	45,75	40,80	36,75	31,60	26,45	21,00
10	65,50	60,00	56,20	50,90	45,90	42,10	38,15	33,05	28,15	23,25
11	63,97	58,86	54,01	49,82	45,57	39,28	37,12	31,64	25,70	21,75
12	62,75	60,85	56,40	52,90	48,50	41,75	38,00	34,45	29,55	25,50
13	63,55	59,70	54,95	50,55	45,75	42,05	36,75	31,40	27,05	22,15
M	64,45	59,87	55,35	50,83	46,38	41,47	36,98	31,87	26,91	22,31
REF.	63,99	59,52	54,93	50,62	46,29	41,30	36,95	31,96	27,01	22,49
SD	1,70	1,52	1,66	1,48	1,47	1,42	1,05	1,40	1,33	1,51

M = mean per sample
SD = standard deviation per sample
REF. = reference values
*: 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 10 laboratories using the reference method ISO 14637 / IDF 195, after outliers discarging using Grubbs test 5% risk level

Table IV : Outlier identification

Sample	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Outliers Cochran								5		
Outlier Grubbs										
sr	0,53	0,45	0,52	0,48	0,48	0,44	0,51	0,23	0,68	0,47
SR	1,74	1,55	1,70	1,51	1,51	1,46	1,11	1,47	1,42	1,54

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

Sample / Lab code	1	2	3	4	5	6	7	8	9	10	d	Sd_{lab}	t
1	+ 0,53	+ 0,61	- 0,36	+ 0,21	+ 0,25	+ 0,64	+ 0,28	- 0,07	- 0,26	- 0,24	+ 0,16	0,37	1,35
2	+ 0,41	+ 0,28	- 0,18	- 0,07	- 0,04	+ 0,65	+ 0,30	- 0,11	+ 0,09	+ 0,26	+ 0,16	0,26	1,88
3	+ 0,41	- 0,42	+ 0,27	- 0,12	- 0,29	+ 0,30	- 0,00	- 0,31	- 0,26	- 0,79	- 0,12	0,37	1,04
4	+ 2,51	+ 2,48	+ 3,07	+ 2,88	+ 2,71	+ 2,70	+ 1,05	+ 2,04	+ 1,99	+ 2,01	+ 2,34	0,59	12,57
5	+ 1,06	- 0,77	+ 0,02	- 0,67	+ 0,66	- 0,15	- 0,20	+ 0,14	- 0,51	+ 0,11	- 0,03	0,57	0,18
6	+ 3,46	+ 3,23	+ 3,47	+ 2,23	+ 1,91	+ 2,10	+ 0,95	- 0,51	- 0,51	- 0,34	+ 1,60	1,61	3,13
7	- 2,39	- 2,02	- 2,48	- 2,12	- 2,29	- 1,80	- 2,25	- 2,51	- 2,01	- 2,24	- 2,21	0,23	31,03
8	- 1,89	- 1,62	- 1,28	- 1,57	- 1,79	- 1,75	- 1,80	- 2,21	- 1,71	- 2,29	- 1,79	0,29	19,28
9	+ 2,06	+ 1,48	+ 1,07	+ 0,28	- 0,54	- 0,50	- 0,20	- 0,36	- 0,56	- 1,49	+ 0,12	1,09	0,35
10	+ 1,51	+ 0,48	+ 1,27	+ 0,28	- 0,39	+ 0,80	+ 1,20	+ 1,09	+ 1,14	+ 0,76	+ 0,81	0,56	4,56
11	- 0,02	- 0,66	- 0,93	- 0,79	- 0,72	- 2,03	+ 0,16	- 0,32	- 1,31	- 0,74	- 0,74	0,63	3,71
12	- 1,24	+ 1,33	+ 1,47	+ 2,28	+ 2,21	+ 0,45	+ 1,05	+ 2,49	+ 2,54	+ 3,01	+ 1,56	1,26	3,91
13	- 0,44	+ 0,18	+ 0,02	- 0,07	- 0,54	+ 0,75	- 0,20	- 0,56	+ 0,04	- 0,34	- 0,12	0,40	0,94
d	+ 0,46	+ 0,35	+ 0,41	+ 0,21	+ 0,09	+ 0,16	+ 0,02	- 0,09	- 0,10	- 0,18	+ 0,13	1,43	
Sd	1,70	1,52	1,66	1,48	1,47	1,42	1,05	1,40	1,33	1,51	1,46		

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

Upper limits : $\bar{d}$ = +/- 2,50 mg / 100 g Sd = 1,50 mg / 100 g

ISO 14637 / IDF 195 : Precision of the method : Sr = 0.54 mg / 100 g
SR = 1.81 mg / 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	+0,31	+0,40	-0,22	+0,14	+0,17	+0,45	+0,27	-0,05	-0,20	-0,16
2	+0,24	+0,18	-0,11	-0,05	-0,03	+0,45	+0,28	-0,08	+0,07	+0,17
3	+0,24	-0,28	+0,16	-0,08	-0,20	+0,21	-0,00	-0,22	-0,20	-0,53
4	+1,47	+1,64	+1,85	+1,95	+1,84	+1,89	+1,00	+1,46	+1,50	+1,33
5	+0,62	-0,51	+0,01	-0,45	+0,45	-0,11	-0,19	+0,10	-0,38	+0,07
6	+2,03	+2,13	+2,09	+1,51	+1,30	+1,47	+0,90	-0,36	-0,38	-0,23
7	-1,41	-1,33	-1,50	-1,43	-1,55	-1,27	-2,15	-1,79	-1,51	-1,49
8	-1,11	-1,07	-0,78	-1,06	-1,21	-1,23	-1,72	-1,58	-1,29	-1,52
9	+1,21	+0,98	+0,64	+0,19	-0,37	-0,35	-0,19	-0,26	-0,42	-0,99
10	+0,88	+0,32	+0,76	+0,19	-0,26	+0,56	+1,14	+0,78	+0,86	+0,50
11	-0,01	-0,43	-0,56	-0,54	-0,49	-1,42	+0,16	-0,23	-0,99	-0,49
12	-0,73	+0,88	+0,88	+1,55	+1,50	+0,31	+1,00	+1,78	+1,91	+1,99
13	-0,26	+0,12	+0,01	-0,05	-0,37	+0,53	-0,19	-0,40	+0,03	-0,23

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

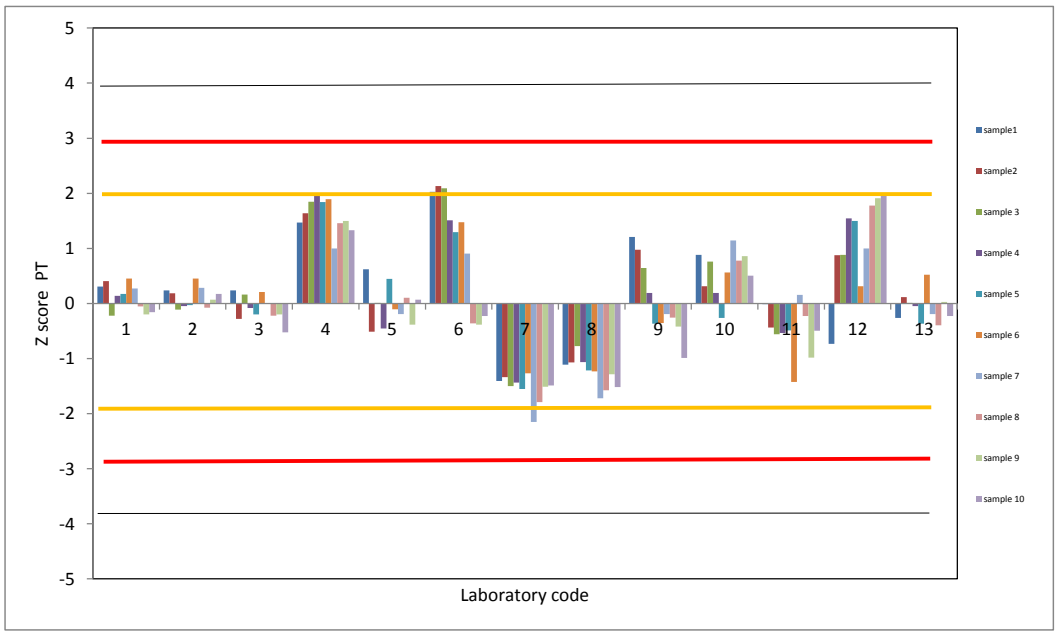


Table VII : **Zscore of the different laboratories for each sample.**
ZS calculated on the standard deviation of reproducibility of the method

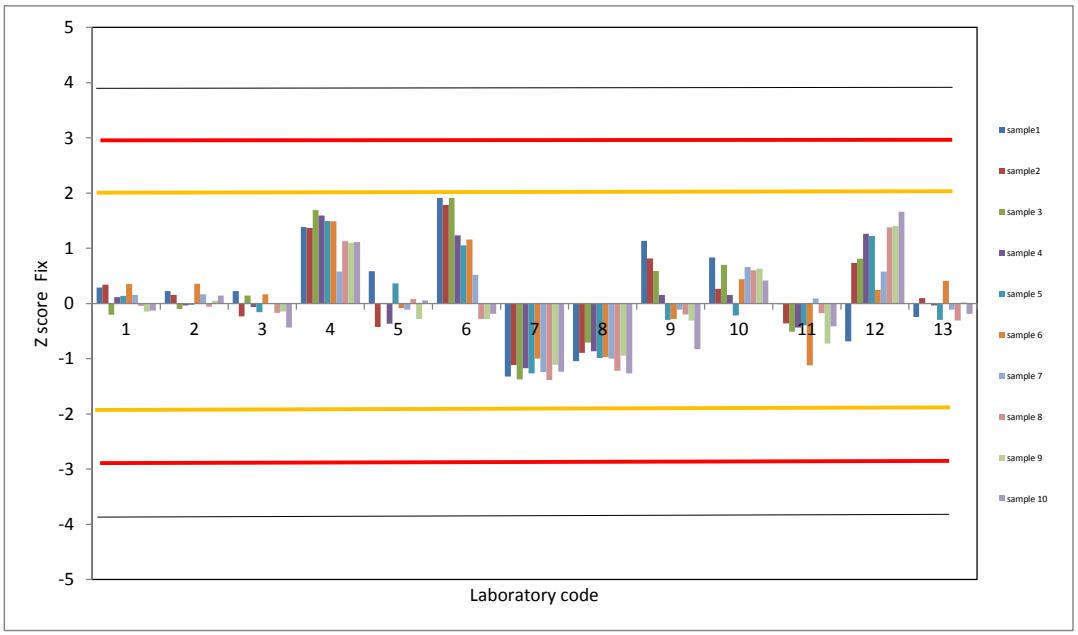
Sample/Lab code	1	2	3	4	5	6	7	8	9	10
1	+0,29	+0,34	-0,20	+0,11	+0,14	+0,35	+0,16	-0,04	-0,14	-0,13
2	+0,22	+0,15	-0,10	-0,04	-0,02	+0,36	+0,16	-0,06	+0,05	+0,14
3	+0,22	-0,23	+0,15	-0,07	-0,16	+0,16	-0,00	-0,17	-0,14	-0,44
4	+1,38	+1,37	+1,69	+1,59	+1,50	+1,49	+0,58	+1,13	+1,10	+1,11
5	+0,58	-0,43	+0,01	-0,37	+0,36	-0,08	-0,11	+0,08	-0,28	+0,06
6	+1,91	+1,78	+1,91	+1,23	+1,06	+1,16	+0,52	-0,28	-0,28	-0,19
7	-1,32	-1,12	-1,37	-1,17	-1,27	-1,00	-1,24	-1,39	-1,11	-1,24
8	-1,05	-0,90	-0,71	-0,87	-0,99	-0,97	-1,00	-1,22	-0,94	-1,27
9	+1,14	+0,82	+0,59	+0,16	-0,30	-0,28	-0,11	-0,20	-0,31	-0,82
10	+0,83	+0,26	+0,70	+0,16	-0,22	+0,44	+0,66	+0,60	+0,63	+0,42
11	-0,01	-0,36	-0,51	-0,44	-0,40	-1,12	+0,09	-0,17	-0,72	-0,41
12	-0,69	+0,73	+0,81	+1,26	+1,22	+0,25	+0,58	+1,38	+1,40	+1,66
13	-0,25	+0,10	+0,01	-0,04	-0,30	+0,41	-0,11	-0,31	+0,02	-0,19

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



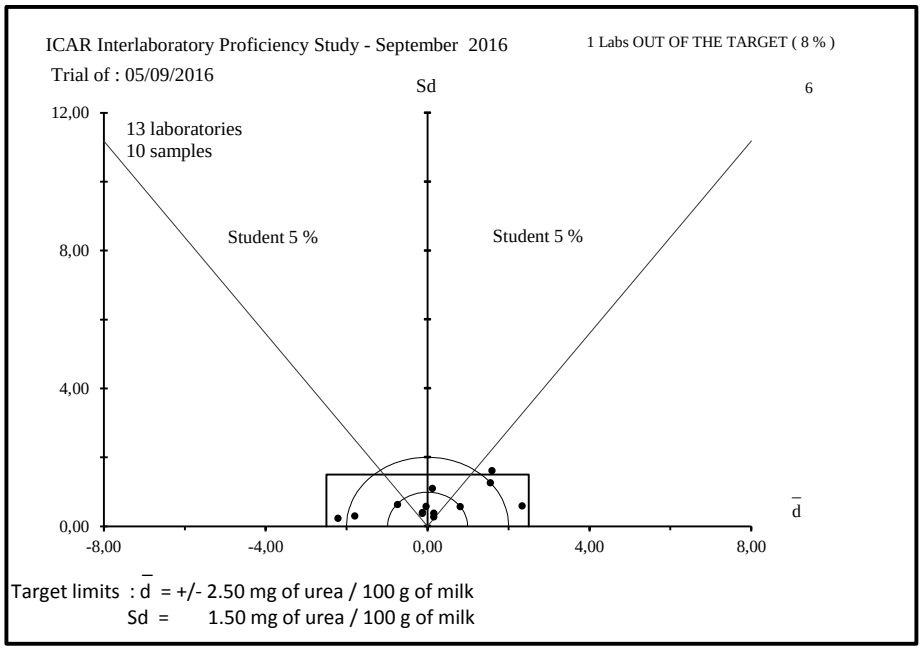


Figure 1 : ACCURACY - Evaluation of the individual performances (to see table I).

LIST OF THE PARTICIPANTS ICAR
ICAR PROFICIENCY TEST
RAW MILK
UREA CONTENT
September 2016

AGROSCOPE	LIEBEFELD	SWITZERLAND
AIA-LAB. STANDARD LATTE	MACCARESE (ROMA)	ITALY
CENTRAL MILK LABORATORY - ICBA	CAESAREA	ISRAEL
DEPARTEMENT QUALITE CRA-W	GEMBLOUX	BELGIUM
EASTERN LAB SERVICES	MEDINA	USA
LOM KCHZ LABORATORIM REFERENCYJNE	PRUSZKOW	POLAND
MILCHPRUFRING BADEN-WURTTEMBERG E.V.	KIRCHEIM / TECK	GERMANY
PIENO TYRIMAI	KAUNAS	LITHUANIA
QLIP N.V.	CM ZUTPHEN	NETHERLAND
UNIV. OF ZAGREB	ZAGREB	CROATIA
UNIVERSITY OF LJUBLIANA	DOMZALE	SLOVENIA
VALACTA	STE ANNE DE BELLEVUE	CANADA

ICAR
PROFICIENCY TESTING SCHEME

September 2016

Raw Milk

SOMATIC CELLS COUNT

Sending date of statistical treatment : 30th september 2016

Frame of activity :	ICAR Milk Analyses Sub Committee (MA SC)	
Contact :	Gavin Scott	gavin@milktest.co.nz
ICAR Staff	Silvia Orlandini	pt@icar.org silvia@icar.org

Proficiency test accreditated ISO 17043

ACCRÉDITATION
N° 1-2473
PORTÉE
DISPONIBLE SUR
WWW.COFRAC.FR

Table I : **Ranking of the laboratories** Units: 10^3 cells / ml

Nb	%	N°	d	Sd	D	Method
1	3	1	- 2%	4%	4%	B
2	6	5	+ 1%	5%	5%	A
3	10	29	+ 2%	5%	5%	B
4	13	24	+ 6%	3%	7%	B
5	16	7	+ 6%	4%	8%	B
6	19	4	+ 6%	5%	8%	B
7	23	12	- 6%	5%	8%	B
8	26	28	- 7%	6%	9%	B
9	29	30	- 7%	7%	10%	B
10	32	25	- 8%	7%	11%	NC
11	35	27	+ 8%	7%	11%	B
12	39	22	- 9%	7%	11%	B
13	42	14	- 9%	7%	12%	B
14	45	21	- 10%	7%	12%	B
15	48	3	- 9%	8%	12%	B
16	52	13	- 10%	9%	13%	B
17	55	15	- 8%	11%	14%	B
18	58	31	+ 10%	10%	14%	B
19	61	19	- 12%	10%	16%	B
20	65	17	- 12%	10%	16%	B
21	68	16	+ 12%	12%	17%	A
22	71	20	- 14%	11%	18%	B
23	74	23	+ 15%	11%	19%	B
24	77	26	+ 16%	13%	21%	B
25	81	6	- 16%	13%	21%	B
26	84	11	+ 17%	13%	21%	B
27	87	2	- 18%	15%	23%	B
28	90	8	+ 18%	17%	25%	A
29	94	10	+ 22%	18%	28%	B
30	97	9	+ 22%	22%	31%	A
31	100	18	+ 26%	74%	78%	B

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% for $\bar{d}$ and 10% for Sd

REF : Assigned values are robust average values per sample according to algorithm A of standard ISO 13528, of 31 laboratories using reference metod ISO 133666-1 IDF 148-1 and alternative method ISO 13366-2 IDF 148-2 after outlier discarging using Grubbs test at 5% risk level

A ISO 13366-1 IDF 148-1
B ISO 13366-2 IDF 148-2

(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.(d^2 + Sd^2))

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}	14	3%
Reproducibility standard deviation of this ICAR proficiency test (after Cochran and Grubbs elimination at 5 %)	SR_{PT}	86	16%

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
1	10	65	22	17	9	8	21	10	5	34	19	20
2	9	46	10	12	16	1	21	15	6	17	14	20
3	0	6	0	20	5	3	44	2	4	15	12	20
4	7	90	8	36	9	30 *	17	21	10	36	25	20
5	12	97	17	16	35	1	37	29	1	31	27	20
6	7	14	6	2	6	3	2	18	3	52	13	20
7	10	10	2	4	22	2	10	11	7	17	8	20
8	4	5	3	3	8	2	7	9	0	13	5	20
9	5	30	8	10	12	7	25	11	0	20	11	20
10	0	25	15	17	7	5	2	18	3	63	17	20
11	10	61	14	0	1	6	11	2	2	67	21	20
12	6	28	1	4	5	2	12	33	3	16	11	20
13	9	20	8	13	28	23 *	2	14	5	30	13	20
14	5	30	13	6	16	4	6	2	7	24	10	20
15	21	3	1	1	11	0	3	0	1	12	6	20
16	2	6	10	6	34	4	42	28	3	41	17	20
17	3	2	4	11	1	8	44	2	6	6	11	20
18	4	183 *	8	48 *	71 *	68 *	0	42	9	20	49	20
19	**	**	**	**	**	**	**	**	**	**		
20	1	35	4	11	21	6	34	21	1	7	13	20
21	3	3	3	3	3	1	4	2	3	9	3	20
22	2	55	2	16	17	3	9	37	3	21	17	20
23	8	4	3	2	4	2	21	12	3	9	6	20
24	6	1	1	3	18	3	6	6	4	76	18	20
25	1	5	14	4	11	3	4	2	6	4	5	20
26	3	1	0	1	7	2	11	3	1	4	3	20
27	7	5	21	2	35	15 *	41	65 *	7	36	21	20
28	4	35	11	26	17	6	2	21	0	9	12	20
29	11	2	6	9	24	4	14	10	3	33	11	20
30	11	9	4	1	3	22 *	3	27	7	1	9	20
31	4	7	0	2	4	5	15	4	4	30	8	20
Sr	5	34	7	11	15	11	15	15	3	22		600
r	25	126	42	50	63	42	126	63	25	126		
NE	60	60	60	60	60	60	60	60	60	60		
L	22	106	28	36	49	12	62	54	14	93		

Sr : repeatability standard deviation of each laboratory limit : **C**f 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 betwen 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 10^3 cells / ml**

Sample / Lab code	1	2	3	4	5	6	7	8	9	10
1	105	1093	278	359	654	172	867	522	48	1215
2	87	906	211	341	570	147	721	430	41	997
3	90	1004	232	368	653	153	795	440	42	1107
4	95	1121	275	416	759	202	907	581	50	1321
5	106	1131	266	424	690	170	850	481	42	1272
6	78	888	226	328	571	148	752	445	43	1039
7	95	1161	281	428	740	189	920	561	54	1300
8	105	1268	297	471	814	195	1062	585	50	1520
9	104	1328	302	457	822	209	1099	609	61	1586
10	111	1326	309	478	842	226	1054	647	56	1531
11	111	1278	311	464	814	236	1039	593	54	1423
12	88	1030	241	385	641	178	795	485	42	1170
13	84	986	236	368	622	163	789	462	43	1093
14	78	999	232	372	627	164	783	471	42	1123
15	95	974	280	359	633	187	769	496	69	1097
16	116	1263	253	443	769	186	948	586	51	1406
17	83	965	234	357	594	157	761	453	41	1077
18	160 *	1599 *	366	583 *	997 *	288 *	40 *	724	84 *	1944 *
19	79	951	231	350	616	167	750	463	34	1096
20	73	921	221	332	615	155	742	453	39	1084
21	84	997	228	352	627	161	782	462	45	1137
22	82	1002	230	356	627	163	775	487	38	1134
23	112	1241	317	467	799	217	990	591	51	1423
24	103	1134	265	433	740	228	897	585	58	1274
25	83	1011	237	369	659	179	780	482	39	1122
26	110	1264	297	476	812	208	1010	590	56	1444
27	102	1202	271	437	749	188	949	581	46	1328
28	90	1036	235	363	671	171	807	485	40	1138
29	95	1146	243	384	687	175	863	573	48	1284
30	86	1019	236	359	627	170	791	538	42	1144
31	95	1214	275	438	769	189	971	565	46	1380
M	94	1095	262	398	693	182	867	530	47	1242
REF.	94	1095	260	398	693	180	865	526	46	1237
SD	12	133	36	49	84	24	112	72	8	162

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 31 laboratories using the reference method ISO 13366 / IDF 148-1 and alternative method ISO 13366-2 IDF 148-2, after outlier discarging using Grubbs test at 5% risk level

Table IV : Outlier identification

Sample	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Outliers Cochran		18		18	18	4;13 18;27 29		27		
Outlier Grubbs	18	18	18	18	18	18	18		18	18
sr	5	25	7	9	12	3	15	13	3	23
SR	13	134	36	49	84	26	112	73	8	164
sr %	6%	2%	3%	2%	2%	2%	2%	2%	7%	2%
SR %	13%	12%	14%	12%	12%	14%	13%	14%	17%	13%

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	+ 12%	- 0%	+ 7%	- 10%	- 6%	- 5%	+ 0%	- 1%	+ 3%	- 2%	- 2%	4%	1,35
2	- 8%	- 17%	- 19%	- 14%	- 18%	- 19%	- 17%	- 18%	- 11%	- 19%	- 18%	15%	3,78
3	- 4%	- 8%	- 11%	- 7%	- 6%	- 15%	- 8%	- 16%	- 9%	- 11%	- 9%	8%	3,89
4	+ 1%	+ 2%	+ 6%	+ 5%	+ 9%	+ 12%	+ 5%	+ 10%	+ 8%	+ 7%	+ 6%	5%	3,82
5	+ 13%	+ 3%	+ 2%	+ 7%	- 1%	- 6%	- 2%	- 9%	- 10%	+ 3%	+ 1%	5%	0,43
6	- 17%	- 19%	- 13%	- 18%	- 18%	- 18%	- 13%	- 15%	- 8%	- 16%	- 16%	13%	3,86
7	+ 1%	+ 6%	+ 8%	+ 8%	+ 7%	+ 5%	+ 6%	+ 6%	+ 16%	+ 5%	+ 6%	4%	4,43
8	+ 12%	+ 16%	+ 14%	+ 18%	+ 17%	+ 8%	+ 23%	+ 11%	+ 8%	+ 23%	+ 18%	17%	3,27
9	+ 10%	+ 21%	+ 16%	+ 15%	+ 19%	+ 16%	+ 27%	+ 16%	+ 32%	+ 28%	+ 22%	22%	3,22
10	+ 18%	+ 21%	+ 19%	+ 20%	+ 21%	+ 25%	+ 22%	+ 23%	+ 20%	+ 24%	+ 22%	18%	3,89
11	+ 18%	+ 17%	+ 20%	+ 17%	+ 17%	+ 31%	+ 20%	+ 13%	+ 17%	+ 15%	+ 17%	13%	4,32
12	- 6%	- 6%	- 7%	- 3%	- 8%	- 1%	- 8%	- 8%	- 10%	- 5%	- 6%	5%	3,86
13	- 11%	- 10%	- 9%	- 8%	- 10%	- 10%	- 9%	- 12%	- 8%	- 12%	- 10%	9%	3,77
14	- 17%	- 9%	- 11%	- 6%	- 10%	- 9%	- 9%	- 11%	- 10%	- 9%	- 9%	7%	4,22
15	+ 1%	- 11%	+ 8%	- 10%	- 9%	+ 4%	- 11%	- 6%	+ 48%	- 11%	- 8%	11%	2,35
16	+ 24%	+ 15%	- 3%	+ 11%	+ 11%	+ 3%	+ 10%	+ 11%	+ 9%	+ 14%	+ 12%	12%	3,11
17	- 12%	- 12%	- 10%	- 10%	- 14%	- 13%	- 12%	- 14%	- 11%	- 13%	- 12%	10%	3,95
18	+ 70%	+ 46%	+ 41%	+ 47%	+ 44%	+ 60%	- 95%	+ 38%	+ 80%	+ 57%	+ 26%	74%	1,10
19	- 16%	- 13%	- 11%	- 12%	- 11%	- 7%	- 13%	- 12%	- 27%	- 11%	- 12%	10%	4,01
20	- 23%	- 16%	- 15%	- 17%	- 11%	- 14%	- 14%	- 14%	- 17%	- 12%	- 14%	11%	4,21
21	- 11%	- 9%	- 12%	- 12%	- 10%	- 11%	- 10%	- 12%	- 4%	- 8%	- 10%	7%	4,63
22	- 13%	- 9%	- 11%	- 10%	- 10%	- 10%	- 10%	- 8%	- 19%	- 8%	- 9%	7%	4,48
23	+ 19%	+ 13%	+ 22%	+ 17%	+ 15%	+ 20%	+ 14%	+ 12%	+ 9%	+ 15%	+ 15%	11%	4,41
24	+ 10%	+ 4%	+ 2%	+ 9%	+ 7%	+ 26%	+ 4%	+ 11%	+ 25%	+ 3%	+ 6%	3%	5,64
25	- 12%	- 8%	- 9%	- 7%	- 5%	- 1%	- 10%	- 8%	- 16%	- 9%	- 8%	7%	3,58
26	+ 17%	+ 15%	+ 14%	+ 20%	+ 17%	+ 15%	+ 17%	+ 12%	+ 20%	+ 17%	+ 16%	13%	3,97
27	+ 8%	+ 10%	+ 4%	+ 10%	+ 8%	+ 4%	+ 10%	+ 10%	- 2%	+ 7%	+ 8%	7%	3,68
28	- 4%	- 5%	- 10%	- 9%	- 3%	- 5%	- 7%	- 8%	- 14%	- 8%	- 7%	6%	3,82
29	+ 1%	+ 5%	- 6%	- 4%	- 1%	- 3%	- 0%	+ 9%	+ 3%	+ 4%	+ 2%	5%	1,20
30	- 9%	- 7%	- 9%	- 10%	- 10%	- 6%	- 9%	+ 2%	- 10%	- 8%	- 7%	7%	3,34
31	+ 1%	+ 11%	+ 6%	+ 10%	+ 11%	+ 4%	+ 12%	+ 7%	- 1%	+ 12%	+ 10%	10%	3,28
d	+ 0%	+ 0%	+ 1%	- 0%	+ 0%	+ 1%	+ 0%	+ 1%	+ 1%	+ 0%	+ 1%	17%	
Sd	13%	12%	14%	12%	12%	14%	13%	14%	17%	13%			

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	1	2	3	4	5	6	7	8	9	10
1	+0,91	-0,02	+0,51	-0,80	-0,48	-0,34	+0,02	-0,06	+0,16	-0,14
2	-0,61	-1,42	-1,36	-1,16	-1,48	-1,39	-1,29	-1,36	-0,68	-1,48
3	-0,32	-0,68	-0,78	-0,61	-0,49	-1,14	-0,62	-1,21	-0,55	-0,80
4	+0,05	+0,20	+0,42	+0,38	+0,78	+0,89	+0,38	+0,76	+0,48	+0,52
5	+0,99	+0,27	+0,16	+0,54	-0,04	-0,45	-0,13	-0,64	-0,61	+0,21
6	-1,35	-1,55	-0,94	-1,43	-1,46	-1,35	-1,01	-1,14	-0,48	-1,22
7	+0,09	+0,50	+0,59	+0,63	+0,56	+0,35	+0,50	+0,48	+0,92	+0,38
8	+0,91	+1,30	+1,02	+1,50	+1,44	+0,60	+1,76	+0,81	+0,48	+1,74
9	+0,79	+1,75	+1,17	+1,22	+1,54	+1,15	+2,09	+1,15	+1,89	+2,15
10	+1,40	+1,73	+1,35	+1,64	+1,77	+1,85	+1,70	+1,68	+1,18	+1,81
11	+1,40	+1,37	+1,42	+1,37	+1,44	+2,28	+1,56	+0,93	+0,99	+1,14
12	-0,48	-0,48	-0,54	-0,26	-0,63	-0,10	-0,62	-0,59	-0,61	-0,41
13	-0,85	-0,82	-0,66	-0,62	-0,85	-0,73	-0,68	-0,90	-0,48	-0,89
14	-1,35	-0,72	-0,79	-0,53	-0,79	-0,67	-0,73	-0,78	-0,61	-0,70
15	+0,05	-0,91	+0,55	-0,80	-0,73	+0,27	-0,86	-0,43	+2,85	-0,86
16	+1,82	+1,27	-0,19	+0,93	+0,91	+0,23	+0,75	+0,83	+0,54	+1,04
17	-0,94	-0,97	-0,72	-0,85	-1,19	-0,96	-0,93	-1,03	-0,68	-0,99
18	+5,43	+3,78	+2,95	+3,81	+3,63	+4,41	-7,38	+2,76	+4,77	+4,35
19	-1,22	-1,08	-0,80	-0,98	-0,92	-0,55	-1,03	-0,89	-1,57	-0,87
20	-1,76	-1,31	-1,08	-1,36	-0,94	-1,04	-1,10	-1,03	-1,00	-0,95
21	-0,85	-0,74	-0,90	-0,95	-0,80	-0,82	-0,74	-0,90	-0,23	-0,62
22	-0,98	-0,70	-0,83	-0,86	-0,80	-0,73	-0,81	-0,56	-1,12	-0,64
23	+1,49	+1,10	+1,58	+1,43	+1,27	+1,50	+1,12	+0,90	+0,54	+1,14
24	+0,75	+0,29	+0,13	+0,72	+0,56	+1,93	+0,29	+0,82	+1,50	+0,23
25	-0,94	-0,63	-0,64	-0,59	-0,42	-0,08	-0,76	-0,62	-0,93	-0,71
26	+1,28	+1,27	+1,03	+1,60	+1,42	+1,13	+1,30	+0,88	+1,18	+1,27
27	+0,62	+0,80	+0,30	+0,81	+0,66	+0,29	+0,75	+0,76	-0,10	+0,56
28	-0,32	-0,44	-0,71	-0,71	-0,27	-0,38	-0,52	-0,59	-0,80	-0,61
29	+0,05	+0,39	-0,47	-0,29	-0,07	-0,22	-0,01	+0,65	+0,16	+0,28
30	-0,69	-0,57	-0,66	-0,80	-0,80	-0,43	-0,66	+0,15	-0,61	-0,58
31	+0,09	+0,89	+0,42	+0,83	+0,91	+0,33	+0,95	+0,54	-0,04	+0,88

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

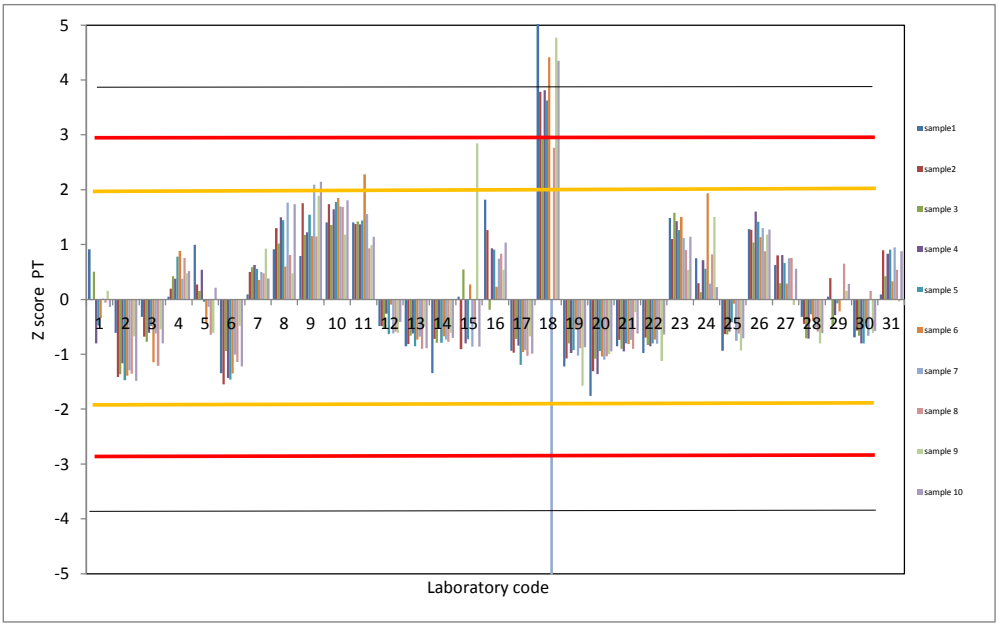


Table VII : **Zscore of the different laboratories for each sample.**

ZS calculated on the standard deviation of reproducibility of the method

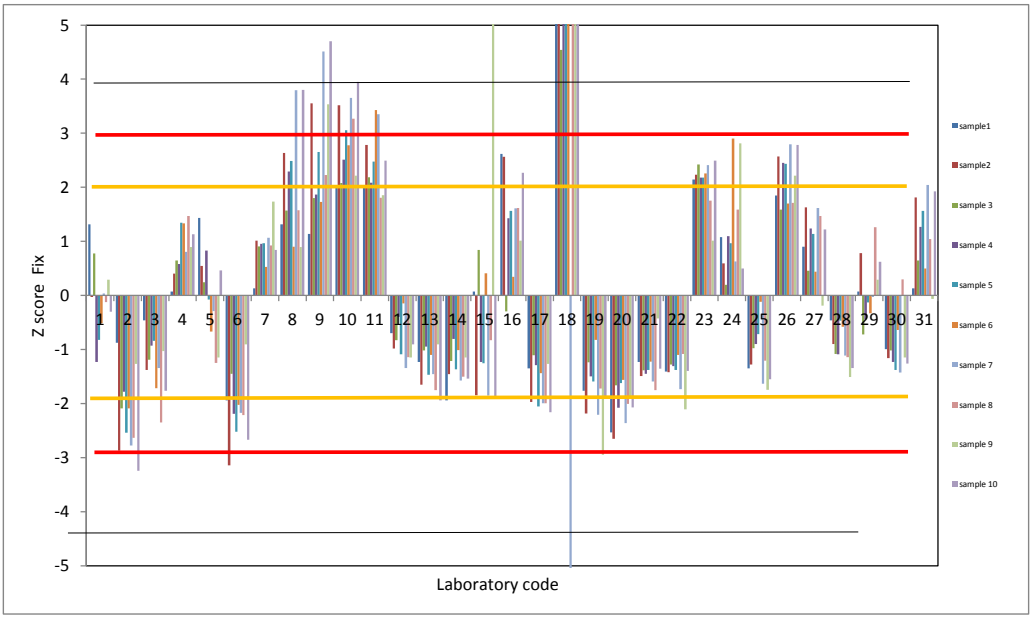
Sample/Lab code	1	2	3	4	5	6	7	8	9	10
1	+1,31	-0,03	+0,78	-1,23	-0,82	-0,52	+0,04	-0,12	+0,29	-0,30
2	-0,87	-2,87	-2,09	-1,78	-2,54	-2,09	-2,78	-2,63	-1,27	-3,24
3	-0,46	-1,38	-1,19	-0,93	-0,84	-1,72	-1,34	-2,35	-1,03	-1,76
4	+0,07	+0,40	+0,65	+0,58	+1,34	+1,33	+0,81	+1,47	+0,89	+1,13
5	+1,43	+0,55	+0,24	+0,83	-0,08	-0,67	-0,29	-1,25	-1,15	+0,46
6	-1,94	-3,15	-1,45	-2,19	-2,52	-2,03	-2,17	-2,21	-0,91	-2,67
7	+0,13	+1,01	+0,90	+0,96	+0,96	+0,53	+1,07	+0,92	+1,73	+0,84
8	+1,31	+2,63	+1,57	+2,29	+2,49	+0,90	+3,80	+1,57	+0,89	+3,80
9	+1,14	+3,55	+1,80	+1,87	+2,65	+1,73	+4,51	+2,23	+3,54	+4,70
10	+2,02	+3,52	+2,08	+2,51	+3,05	+2,78	+3,65	+3,27	+2,21	+3,95
11	+2,02	+2,79	+2,19	+2,09	+2,48	+3,43	+3,35	+1,81	+1,85	+2,50
12	-0,70	-0,98	-0,83	-0,40	-1,09	-0,15	-1,34	-1,14	-1,15	-0,91
13	-1,23	-1,65	-1,02	-0,95	-1,47	-1,10	-1,46	-1,75	-0,91	-1,94
14	-1,94	-1,46	-1,21	-0,80	-1,37	-1,01	-1,57	-1,51	-1,15	-1,54
15	+0,07	-1,84	+0,84	-1,23	-1,25	+0,41	-1,85	-0,83	+5,34	-1,89
16	+2,62	+2,56	-0,29	+1,43	+1,56	+0,35	+1,61	+1,62	+1,01	+2,27
17	-1,35	-1,97	-1,11	-1,29	-2,06	-1,44	-2,00	-1,99	-1,27	-2,16
18	+7,82	+7,67	+4,54	+5,83	+6,25	+6,63	-15,90	+5,36	+8,94	+9,52
19	-1,76	-2,19	-1,23	-1,50	-1,59	-0,82	-2,21	-1,72	-2,95	-1,90
20	-2,53	-2,65	-1,66	-2,08	-1,62	-1,56	-2,36	-2,01	-1,87	-2,07
21	-1,23	-1,49	-1,38	-1,45	-1,38	-1,22	-1,59	-1,75	-0,43	-1,36
22	-1,41	-1,42	-1,28	-1,31	-1,38	-1,10	-1,74	-1,08	-2,11	-1,40
23	+2,14	+2,23	+2,42	+2,18	+2,18	+2,26	+2,41	+1,75	+1,01	+2,50
24	+1,08	+0,59	+0,20	+1,10	+0,96	+2,90	+0,63	+1,59	+2,81	+0,50
25	-1,35	-1,28	-0,98	-0,90	-0,72	-0,12	-1,63	-1,21	-1,75	-1,55
26	+1,85	+2,57	+1,59	+2,45	+2,44	+1,70	+2,79	+1,71	+2,21	+2,79
27	+0,90	+1,63	+0,46	+1,24	+1,14	+0,44	+1,62	+1,47	-0,19	+1,22
28	-0,46	-0,90	-1,08	-1,09	-0,47	-0,58	-1,11	-1,14	-1,51	-1,34
29	+0,07	+0,78	-0,72	-0,44	-0,13	-0,33	-0,03	+1,26	+0,29	+0,62
30	-0,99	-1,16	-1,02	-1,23	-1,38	-0,64	-1,43	+0,30	-1,15	-1,26
31	+0,13	+1,81	+0,65	+1,27	+1,56	+0,50	+2,04	+1,05	-0,07	+1,92

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 5./8

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



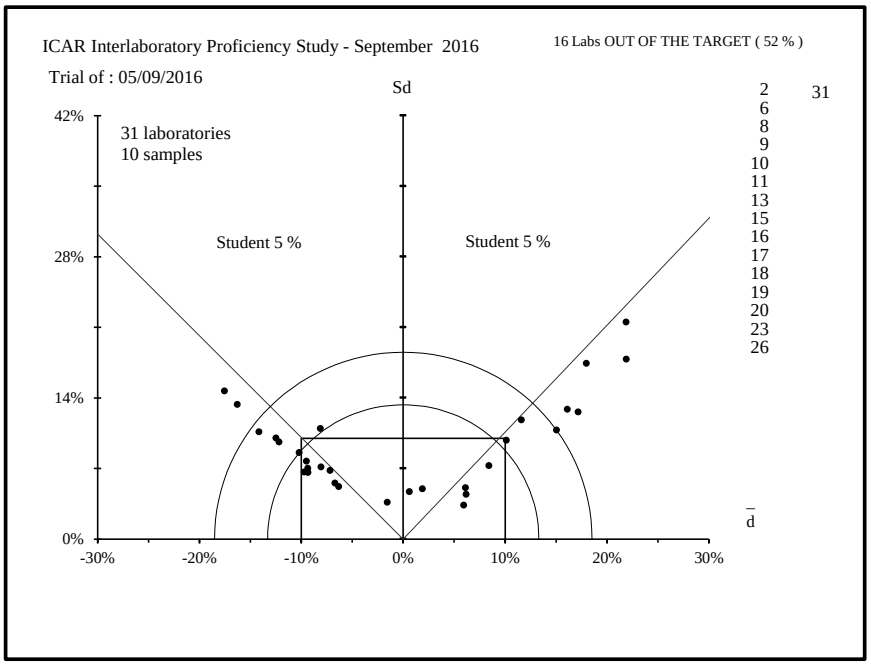


Figure 1 : ACCURACY - Evaluation of the individual performances (to see table I).

LIST OF THE PARTICIPANTS ICAR
ICAR PROFICIENCY TEST
RAW MILK
SOMATIC CELL COUNT
September 2016

ACTALIA	POLIGNY	FRANCE
AGROSCOPE	LIEBEFELD	SWITZERLAND
CATTLE INFORMATION SERVICE	TELFORD	UNITED KINGDOM
CENTRAL MILK LABORATORY - ICBA	CAESAREA	ISRAEL
COMITÉ DU LAIT ASBL	BATTICE	BELGIUM
DELTAMUNE	PRETORIA	SOUTH AFRICA
DIR. DE L'AMELIORATION GENETIQUE	SIDI THABET	TUNISIA
EASTERN LAB SERVICES	MEDINA	USA
FED.LATTERIE SOCIALI DI BOLZANO	BOLZANO	ITALY
LAB AGROAL DE SANTANDER	SANTANDER	SPAIN
LAB PRO ROZBOR MLÉKA	BUSTEHRAD	CHECH REPUBLIC
LAB. POLJOPRIVREDNI	NOVI SAD	SERBIA
LACTOLAB	IRENE	SOUTH AFRICA
LOM KCHZ LABORATORIM REFERENCYJNE	PRUSZKOW	POLAND
MERIEUX NUTRISCIENCE	CAPE TOWN	SOUTH AFRICA
MERIEUX NUTRISCIENCE	MIDRAND	SOUTH AFRICA
MILCHPRUFRING BADEN-WURTTEMBERG E.V.	KIRCHEIM / TECK	GERMANY
MILK TEST	HAMILTON	NEW ZEALAND
OSUUSKUNTA SATAMAITO	PORI	FINLAND
PIENO TYRIMAI	KAUNAS	LITHUANIA
PLEMENÁRSKE SLUZBY SR S.P.	ZILINA	SLOVAKIA
QLIP N.V.	CM ZUTPHEN	NETHERLAND
SUISSE LAB AG	ZOLLIKOFEN	SWITZERLAND
UNIV OF LJUBLJANA	DOMZALE	SLOVENIA
VALACTA	STE ANNE DE BELLEVUE	CANADA