Project of «Assistance to regional cooperation among the member-states of the RMO of COOMET»

Minutes of the Regional Seminar
"Measurement of Uncertainty in the Field of Mass Metrology"

5th –7th of October, 2010 *Tbilisi, Georgia*

Participants

Representatives of the state metrological institutions of the COOMET member-states:

Country	Name, Surname	Organization
Azerbaijan	1. Tamilla Shabiyeva	National Center for Metrology under the Committee for Standards, Metrology and Patents of Republic of Azerbaijan, head of sector
Armenia	2. Eduard Rustamyan	National Metrology Institute of Armenia
Belarus	3. Sviatlana Babaryka	Belarus State Institute of Metrology
Georgia	4. Lali Gogoberidze	Ministry of Economic and Sustainable Development (MOESD)
	5. Kakhaber Guledani	GeoSTM, Director General
	6. Nino Mikanadze	GeoSTM, Director of Metrology Institute
	7. Soso Rogava	GeoSTM, head of mechanics lab
	8. Irma Rurua	GeoSTM, head of mass lab
	9. Irakli Maglapheridze	GeoSTM,specialist of mass lab
	10. Ira Kareli	GeoSTM
	11. Victoria Kazieva	GeoSTM
	12. Nana Lashauri	GMP, head of lab
	13. Ketevan Tsotsoria	GMP
Germany	14. Karl-Christian Goethner	PTB
	15. Martin Firlus	PTB
	16. Anna Pfaff	PTB
	17. Olaf Schnelle-Werner	ZMK
Kazakhstan	18. Dinara Mukasheva	Kazakh Institute of Metrology
Kyrgyzstan	19. Ekaterina Kotova	Standardization and Metrology Center, Head of Mechanic and Geometric measurement standards
Lithuania	20. Ilona Milkamanaviciene	Vilnius metrology center/state metrology service, engineer-metrologist
Moldova	21. Olessya Barcari	National Institute for Standards and Metrology, Republic of Moldova
Moldova	22. Maria Varvasi	National Institute for Standards and Metrology, Republic of Moldova
Russia	23. Yury Kamenskikh	Research worker of VNIIM n.a. D. I. Mendeleev, assistant to the scientific keeper of the national mass measurement standard of RF
Tajikistan	24. Rustam Negmatov	Head of Kuliabin regional service of Tajikstandard
Tajikistan	25. Jurahon Rakhimov	Agency of Tajikstandard, head of metrology control
Uzbekistan	26. Makhmud Kayumov	State Institution "Center of National Measurement Standards of Republic Uzbekistan", head of department
Ukraine	27. Pavlo Neyezhmakov	NSC "Institute of Metrology", head of COOMET secretariat
	28. Iryna Kolozinska	NSC "Institute of Metrology", COOMET TC 1.6

Program of the regional seminar:

Date	Time	Type of activity	Reporter
Oct. 5	09:45	Registration	
	10:00 – 10:20 Opening		
	10:00 – 10:15	Opening of the seminar	Lali Gogoberidze (MOESD), Kakhaber Guledani, GeoSTM DG, Pavlo Neyezhmakov (COOMET)
	10:15 – 10:20	Presentation of the experts and the program	Karl-Christian Goethner
	10:20 - 13:30 Part I: Introduction into the theoretical problems of uncertainty calculation		
	10:20 – 10:50	General description and basic aspects of measurement uncertainty;	Martin Firlus (PTB)
	10:50 – 11:10	Discussion	Christian Göthner
	11:10 – 11:40	Installation and derivation of measurement uncertainty in the field of mass, based on GUM	Martin Firlus
	11:10 – 11:40	Estimation of measurement uncertainty in accordance to GUM and OIML Recommendation OIML R 111 Weights of classes E1, E2, F1, F2, M1, M1–2, M2, M2–3 and M3 Part 1: Metrological and technical requirements.	Irina Kolozinskaja
	11:40 – 12:10	Discussion	Christian Göthner
	12:10 12:20	GEOSTM's new Mass Laboratory – Introduction to the equipment and the ranges	Irma Rurua (GEOSTM)
	12:20 – 12:30	Discussion	Christian Göthner
	12:30 – 13:00	Introduction to COOMET Recommendations for data evaluation key and supplementary comparisons – Juxtaposition	Pavel Neyeshmakov (COOMET)
	13:00 – 13:30	Discussion	Christian Göthner
	13:30 – 14:30 Lunch		
	14:30 – 16:00 Part II: Introduction into the practical exercise of uncertainty calculation		
	14:30 – 15:00	Presentation of measurement uncertainty in the field of mass – practical implementation	Martin Firlus

	Time	Type of activity	Reporter
	15:00 – 15:20	Influences on mass determination	Irma Rurua (GEOSTM)
	15:20 – 16:00	Determination of air density – formula and measurement uncertainty	Olaf Schnelle-Werner (ZMK)
	16:00 – 16:30 Coffee Break		
	16:30 – 18:00	***Part III: Practical exercise***	Irma Rurua / Martin Firlus / Olaf Schnelle-Werner
Oct 6	10:00 – 13:00	Presentation: Calibration of balances Practical exercise (cont.)	Irma Rurua / Martin Firlus / Olaf Schnelle-Werner
	13:00 – 14:00 Lunch		
	14:00 – 17:30	***Part IV: Evaluation of the results***	Irma Rurua / Martin Firlus / Olaf Schnelle
Oct 7	***10:00 – 12:30 Часть IV:***	***Free disposition for the application of uncertainty calculation***	Irma Rurua / Martin Firlus / Olaf Schnelle
	12:30 – 13:00	***Evaluation and closure***	
	12:30 – 12:45	Evaluation of the seminar and next steps	Christian Göthner (PTB) Pavel Neyeshmakov (COOMET)
	12:45 – 13:00	Closure	Nino Mikanadze (GEOSTM) Pavel Neyeshmakov (COOMET)

Opening of the seminar

Mr. **Kakhaber Guledani, Director General of GEOSTM**, opened the regional seminar "Measurement of Uncertainty in the Field of Mass Metrology".

Mrs. **Lali Gogoberidze, head of department of the Ministry of Economic and Sustainable Development** welcomed the participants on behalf of the ministry and wished everyone a fruitful and successful work at the seminar.

Mrs. **Anna Pfaff – the coordinator** of the bilateral project – and Mr. **Martin Firlus – scientist-keeper of the PTB mass measurement standard –** greeted the participants on behalf of **PTB**.

On behalf of COOMET the participants were welcomed by Mr. **Pavlo Neyezhmakov – Head of the COOMET Secretariat** – who marked the importance of the seminar for the whole Region.

Moderator of the Seminar (PTB) – Karl-Christian Goethner – familiarized the participants with the aims of the seminar:

- Development and expansion of technical capabilities of the national metrology institutes by the example of the GEOSTM mass lab;
- Practical studies on measurement in GEOSTM mass lab;
- Practical studies on evaluation of results of mass measurements;
- Steps essential for preparing CMC for publication in BIPM KCDB.

Introduction of the participants

Participants of the seminar introduced themselves to each other.

Part I: Introduction into the theoretical problems of uncertainty calculation

1.1. Presentation: «Mass and Uncertainty»
Reporter: Martin Firlus – keeper of the PTB mass measurement standard.

1.2. Presentation: «Evaluation of measurement uncertainty according to GUM and OIML »
Reporter: Iryna Kolozinska, member of the COOMET TC 1.6, NSC "Institute of Metrology".

Discussion:

E. Kotova: *How do I consider sensitivity in the uncertainty budget?*
M. Firlus: It depends on comparator positioning and class of weights.
E. Kotova: *How do I consider sensitivity contribution in the uncertainty when using electronic weigths instead of comparator?*
M. Firlus: *If you use weights of class E or F – statistical information will do, otherwise you take* S_{pool} *. It's recommended to perform 6 series of ABBA for statistics.*
S. Rogava: *How do I consider magnetization power?*
M. Firlus: According to IOML recommendation *111. You can introduce weight drift contribution additionally.*

1.3. Presentation: "New Mass Lab of GEOSTM – Introduction to the equipment and the ranges"
Reporter: Head of GEOSTM Mass Lab – Irma Rurua.

1.4. Presentation: «Introduction to COOMET Recommendations for evaluation of data comparison of key and additional comparisons.»
Reporter: Pavlo Neyezhmakov – Head of COOMET Secretariat.

Discussion:

I. Milkamanaviciene: *What should be the range of uncertainty for a lab to be able to take part in comparisons?*
P. Neyezhmakov: E_n*-criterion should be provided, in a lab provides the maximum of* E_n*-criterion its data is temporarily excluded from consideration. The lab should conduct an analysis in order to discover the reason for the drop-out of its results and make a decision whether the result is a matter of failure or explain the reason for undervaluing the declared uncertainty.*
I. Milkamanaviciene: *Will there be other comparisons in mass organized within the framework of COOMET?*
I. Kolozinska: *At this stage the current projects are being finished. It's planned to conduct a new circle of comparisons in the future year since many institutes have updated their equipment.*

Recommendation of P. Neyezhmakov: *Countries interested in participating in comparisons can look for the information on finished and current comparisons in COOMET and KCDB data bases. .*

*There are data on status on comparisons in mass in **annex B** of KCDB "mass" part, so you can find there all the information you need about it.*

Recommendation P. Neyezhmakov *called the representatives of NMIs from Central Asia and Transcaucasia who haven't yet signed the CIPM MRA agreement to inform their top-management about the importance of entering CIPM MRA.*

1.5. Prezentation: "Presentation of measurement uncertainty in the field of mass – practical implementation"

Reporter: Keeper of the PTB mass measurement standard – Martin Firlus.

Part II: ***Part II: Introduction into the practical exercise of uncertainty calculation. Familiarization with the GEOSTM mass lab.***

Participants of the seminar split into 4 groups for conducting practical measurements in GEOSTM mass lab.

Group members:

Group 1:	**Group 2:**	**Group 3:**	**Group 4:**
E. Rustamyan	M. Varvasi	D. Mukasheva	I. Milkamanaviciene
T. Shabiyeva	E. Kotova	O. Barcari	Y. Kamenskikh
S. Babaryka	I. Kolozinska	J. Rakhimov	N. Lashauri
	M. Kayumov	R. Negmatov	

Discussion after familiarization with the new GEOSTM mass lab:

J. Rakhimov: *What is the cost of the project and its duration?*
A. Pfaff: *The cost is around 279 000 USD, duration – about 2 years.*
J. Rakhimov: *How traceability is provided for the measurement standard?*
I. Rurua: *One set of weights is traceable to PTB, the other to DKD.*
M. Varvasi: *What are the results of the comparison?*
I. Rurua: *Uncertainty is less than 0,1%.*
J. Rakhimov: *What about the financing of the project that covered establishment and equipment of the lab?*
A. Pfaff: *Works on creation of the mass lab were identified within the framework of bilateral German-Georgian cooperation project. PTB purchased the equipment of comparators as well as climate-control system for the rooms and trainings. Georgian part covered financial costs for reconstruction works for the rooms.*
E.Kotova: *Is ABBA cycle applicable when using equal-armed weights instead of comparator?*
M.Firslus: *It is applicable if you put a container on one arm of the weights and then conduct the measurements.*
E.Kotova: *What method should I use then?*
М.Фирлус: *It's preferable to use Gauss method.*

2.1. Presentation: «Calibration of Weights »

Reporter: Keeper of the PTB mass measurement standard – Martin Firlus.

2.2. Practical exercise on evaluation of uncertainty in mass measurements

Reporter: Keeper of the PTB mass measurement standard – Martin Firlus.

Discussion

I. Milkamanaviciene: *Is this mass or conventional mass?*

M. Firlus: *The example was performed with mass.*
I. Kolozinska: *What about the measurement cycle if it gives a big difference in measurement results?*
M. Firlus: *Results of this cycle should be rejected and the measurement should be continued from the beginning.*

Recommendation of M. Firlus: *Usually measurement results of the first cycle are not used.*

I.Kolozinska: *What to do if you don't have a full data on weights?*
M. Firlus: *First you have to define the conventional mass and then the actual one.*
I.Kolozinska: *For which accuracy classes of weights is it enough to indicate in its certificate only conventional mass, not the actual?*
M. Firlus: *PTB calibration certificates have the same form for all classes of weights. It depends on requirements of the customer. Its recommended to indicate all the data.*
I. Milkamanaviciene: *For which classes of weights is it required to introduce the buoyancy force correction?*
M. Firlus: *For class E, for class M it's not obligatory, but it's anyway up to you.*

2.3. Presentation: "Determination of air density – formula and measurement uncertainty"
Reporter: Olaf Schnelle-Werner (ZMK).

Discussion

I.Kolozinska: *How often should the adjusting constant?*
O. Schnelle-Werner: *Each day, either at the beginning of the work day or after a lunch break, since a comparator performs selfadjustment the being turn on in the morning.*

2.4. Presentation: "Influences on mass determination"
Reporter: Irma Rurua (GEOSTM).

Discussion

K. Tsotsoria: *How should be the weights cleaned?*
I. Rurua: *They should be cleaned by a brush or a air cleanser. A weight that is polluted very much is to be washed in distilled water without alcohol since it destroys the thin absorption layer of the weight.*
K. Tsotsoria: *Where to keep the weights?*
I. Rurua: *The weights should be kept only under a glass.*
E.Kotova: *Are there any appliances existing that can demagnetize weights?*
M. Firlus: *Yes, but there's no guarantee that magnetism won't occur again. Mechanical knock is recommended for getting rid of magnetism. In case of a repeated magnetism it's recommended to withdrow the weight from use since it may destroy a comparator.*

Part III: *Practical exercise*

3.1. Manual on expression of measurement uncertainty. Continuation of practical studies in evaluation of mass measurement uncertainty.
Reporter: Keeper of the PTB mass measurement standard – Martin Firlus.

3.2. Continuation of practical studies. Budget of mass measurement uncertainty.
Reporter: Keeper of the PTB mass measurement standard – Martin Firlus.

Discussion

I. Kolozinska: *Is it acceptable to raise a weight class if the calibration produced good results?*
O.Schnelle-Werner: If all requirements of IOML 111 are executed it's acceptable to raise the level of a weight from class E2 to class E1 with permissible accuracy.

Part IV: Evaluation of the results

All the participants of the seminar filled out the evaluation sheets and had a word about organization and conduction of the seminar. Hospitality of the host was marked by everyone as well as success in inauguration of the new mass lab.

Future Steps

Pavel Neyezhmakov informed the participants about the subject of the next seminar on organization of comparisons and methods of processing results of comparisons in the field of mass, planned for 2011.

Nino Mikanadze expressed gratitude to all the participants, COOMET and PTB for organizing and conducting this seminar.

Karl-Christian Goethner summarized the results of the seminar which was of a great interest from the point of its usefulness and fruitfulness and he also pointed out the next steps.

Martin Firlus and **Pavel Neyezhmakov** handled certificates and souvenirs to the participants.

Annex 1. Summarized evaluation sheet of the seminar – 2 p.

Pavel Neyezhmakov,
Head of COOMET Secretariat
Chairman of TC 4 "Information and training"

Manana Gelovani,
Specialist of Electricity Lab
GeoSTM,

Karl-Christian Goethner,
moderator, PTB