

**Eurachem Workshop - Uncertainty from sampling and analysis for accredited laboratories**



*A Eurachem International Workshop  
in conjunction with  
Eurolab Germany and CITAC.*

Date: 19-20 November 2019

Venue: BAM headquarters, Unter den Eichen, Berlin, Germany

**FULL SCIENTIFIC AND SOCIAL PROGRAMME**



# Uncertainty from sampling and analysis for accredited laboratories

## Programme Overview

**MONDAY 18<sup>th</sup> of November**

**18:00-22:00**

**PRE-REGISTRATION AND WELCOME RECEPTION**

**AT THE HOTEL STEGLITZ INTERNATIONAL**

**TUESDAY 19<sup>th</sup> of November**

**09.00-17.00**

**WORKSHOP AT BAM**

**19:00-24:00**

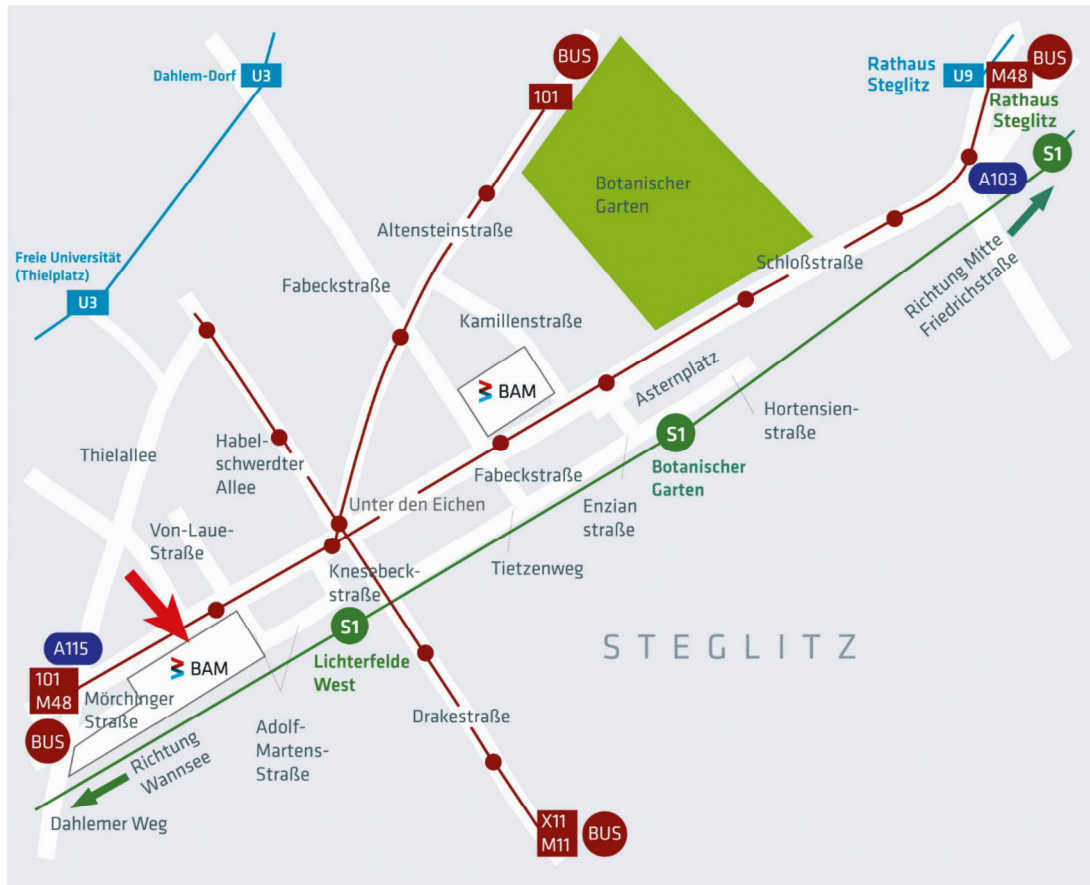
**WORKSHOP DINNER AT OSTERIA MARIA**

**WEDNESDAY 20<sup>th</sup> of November**

**09.00-17.00**

**WORKSHOP AT BAM**

### Venue and Location



## Workshop Aims

### **The workshop aims to discuss:**

- New provisions in the recently revised Eurachem Guide “Measurement uncertainty arising from sampling”
- Improved methods for evaluating uncertainty from sampling
- Current approaches to the evaluation of measurement uncertainty in analysis
- Limitations in uncertainty evaluation under the ISO Guide to the Expression of Uncertainty in Measurement (GUM)
- New approaches for expressing measurement uncertainty – large uncertainties and asymmetry
- Recent developments in uncertainty evaluation using validation and QC data
- Measurement uncertainty, conformity assessment and decision rules in ISO/IEC 17025:2017
- Measurement uncertainty and regulation
- Software for measurement uncertainty evaluation
- Planning and accreditation of sampling under ISO/IEC 17025:2017
- New directions for international guidance – the future of the GUM

### **The workshop will help laboratory managers and staff concerned with**

- designing and implementing sampling protocols to ensure acceptable levels of uncertainty in results and conclusions
- developing and maintaining field or laboratory procedures for measurement uncertainty evaluation and reporting to meet the requirements of ISO/IEC 17025:2017
- reporting measurement uncertainty in conformity assessment decisions under ISO/IEC 17025:2017

# Uncertainty from sampling and analysis for accredited laboratories Scientific Programme\*

## Day 1: Tuesday 19th November 2019 Introducing uncertainty, and uncertainty from sampling

08:30 – 09:00	<i>Registration</i>
09:00 – 09:30	<b>Welcome and Opening Remarks</b>
	<b>Welcoming remarks</b> <i>from Director BAM, and Chairman EUROLAB Germany,</i>
	<b>Introduction to EURACHEM and its activities</b> <i>Marina Patriarca (ISS, Italy; Chair of EURACHEM)</i>
	<b>Introduction to the measurement uncertainty workshop</b> <i>Steve Ellison (LGC, UK)</i>
09:30 – 10:30	<b>Introducing measurement uncertainty</b>
	<b>Introduction to measurement uncertainty</b> <i>Wolfhard Wegscheider (Montanuniversitaet Leoben, Austria)</i>
	<b>Overview of Uncertainty from Sampling (UfS) and the Eurachem Guide (2019)</b> <i>Mike Ramsey (University of Sussex, UK)</i>
10:30 – 11:00	<i>Coffee and Posters*</i>
11:00 – 12:00	<b>New features in the Eurachem UfS Guide 2<sup>nd</sup> Edition</b>
	<b>Expressing uncertainty as an uncertainty factor, and Combining sampling and analytical uncertainty</b> <i>Mike Ramsey (University of Sussex, UK)</i>
	<b>Using unbalanced designs to reduce cost of sampling uncertainty estimation</b> <i>Peter Rostron (UK)</i>
12:00 – 13:15	<i>Lunch and Poster* time</i>
13:15 – 13:45	<b>Applications of UfS estimation across a range of sectors.</b> <i>Ariadne Argyraki (University of Athens, Greece)</i>
13:45 – 15:00	<b>Parallel discussion sessions</b>
	<b>Session 1: Applications of Uncertainty from Sampling</b>
	<b>Session 2: Methods for evaluating Uncertainty from Sampling</b>
15:00 – 15:30	<i>Coffee and Posters*</i>
15:30 – 15:50	<b>Parallel session summaries</b>
15:50 – 16:30	<b>Accreditation perspectives</b>
	<b>ILAC Guidance on contribution to measurement uncertainty arising from sampling and testing</b> <i>Erik Oehlenschlaeger (ILAC)</i>
	<b>The role of accreditation in assuring the quality of sampling</b> <i>Lawrence Bilham (UKAS)</i>
16:30 – 16:50	<b>The way forward for Uncertainty from Sampling.</b> <i>Mike Ramsey</i>
16:50 – 17:00	<b>Discussion and Close</b>

\*A full list of posters and all abstracts can be found at [www.eurachem.org/MU2019Abstracts](http://www.eurachem.org/MU2019Abstracts)

# Uncertainty from sampling and analysis for accredited laboratories Scientific Programme\*

## Day 2: Wednesday 20th November 2019 Evaluation and use of measurement uncertainty

09:00 – 09:45	<b><i>Approaches to measurement uncertainty evaluation</i></b>
	Eurachem guidance on Measurement Uncertainty - Guides, leaflets and current work <i>Steve Ellison (LGC, UK)</i>
	<b>Current approaches to the evaluation of measurement uncertainty in analysis</b> <i>Vicki Barwick (LGC, UK)</i>
09:45 – 10:45	<b><i>Evaluating uncertainty from validation and QC data</i></b>
	MUkit – software for uncertainty from validation and QC according to Nordtest 537 - handling both absolute and relative uncertainty <i>Teemu Näykki</i>
	<b>Uncertainty from validation and QC data</b> <i>Ricardo Bettencourt da Silva (Univ. Lisbon)</i>
10:45 – 11:15	<i>Coffee and Posters*</i>
11:15 – 11:45	<b><i>Focussing on large uncertainties</i></b>
	<b>Uncertainty estimation when the uncertainty is high</b> <i>Alex Williams</i>
	<b>Reporting high uncertainty - Asymmetry, Uncertainty Factors and log units</b> <i>Bertil Magnusson</i>
11:45 – 12:00	<b><i>Conformity assessment</i></b>
	<b>Conformity and measurement uncertainty – an introduction</b> <i>Steve Ellison</i>
12:00 – 13:45	<i>Lunch and Poster* time</i>
13:45 – 15:00	<b><i>Parallel discussion sessions</i></b>
	Session 1: Conformity assessment  Session 2: Handling high uncertainty, asymmetry and bias  Session 3: Software for MU evaluation
15:00 – 15:30	<i>Coffee and Posters*</i>
15:30 – 16:00	<b><i>Parallel session summaries</i></b>
16:00 – 16:30	<b>Joint Committee for Guides in Metrology (JCGM) – Current work and future guidance</b> <i>Adriaan van der Veen (VSL, NL)</i>
16:30 – 16:45	<b><i>Workshop summary and closing discussion</i></b> <i>Mike Ramsey and Steve Ellison</i>
16:45	<b>CLOSE</b>

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# Uncertainty from sampling and analysis for accredited laboratories Parallel Session Programme\*

Day 1: 19th November 2019 Introducing uncertainty, and uncertainty from sampling  
13:45-15:00

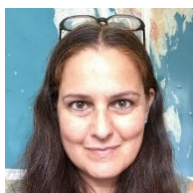
Session 1: Applications Chair: Ariadne Argyraki	Session 2: Methods Chair: Steve Ellison
<p><b>K. Tsimillis, S. Michael.</b> Uncertainty from Sampling: Could the requirements of ISO/IEC 17025:2017 be adopted in medical laboratories?</p> <p><b>N. Guigues, B. Lepot, J. Durocher.</b> Estimation of the measurement uncertainty, including the contribution arising from sampling, of water quality parameters in surface water of the Loire River Basin, France</p> <p><b>Dr C. Tiebe, M. E. Bayat, M. Bartholmai.</b> Uncertainty from sampling of trace explosives amounts and detection by ion mobility spectrometry</p>	<p><b>P. Rostron.</b> Comparing Uncertainty Values – are they really different?</p> <p><b>C. Borges, C. Palma, T. Dadamos, R. Bettencourt da Silva.</b> Evaluation of the sampling uncertainty from the Monte Carlo Simulation of georeferenced information</p> <p><b>F. Coimbra.</b> Uncertainty from sampling in microbiological water analysis</p>
<b>Discussion</b>	<b>Discussion</b>

Day 2: Wednesday 20th November 2019. Evaluation and use of measurement uncertainty  
13:45-15:00

Session 1: Conformity assessment Chair: Alex Williams	Session 2: Handling high uncertainty, asymmetry and bias Chair: Wolfhard Wegscheider	Session 3: Software for MU evaluation Chair: Bertil Magnusson
<p><b>I. Kuselman, F. Pennecci, R. Bettencourt da Silva, D. Brynn Hibbert.</b> Shades of grey in conformity assessment due to measurement uncertainty</p> <p><b>R. Bettencourt da Silva, F. Lourenço, D. B. Hibbert.</b> Multivariate and correlated acceptance limits for conformity assessment</p> <p><b>R. Bettencourt da Silva.</b> An introduction to ILAC G8</p>	<p><b>S. Uhlig, K. Simon, B. Colson, K Hettwer, K Frost.</b> Measurement uncertainty in the case of large and heterogeneous variances: A new method for the calculation of asymmetric uncertainty intervals</p> <p><b>S. Uhlig, K. Simon, B. Colson, K Hettwer, K Frost .</b> How to address matrix mismatch bias in the uncertainty budget</p>	<p><b>K. Hettwer.</b> Webtool for taking measurement uncertainty into account in the implementation of the Federal Soil Protection and Contaminated Sites Ordinance</p> <p><b>M Koch.</b> Excel tool for estimation of measurement uncertainty from validation and quality control data according to ISO 11352</p> <p><b>S Ellison.</b> Measurement uncertainty in R: The metRology package</p>
<b>Discussion</b>	<b>Discussion</b>	<b>Discussion</b>

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## Principal speakers:



### Ariadne ARGYRAKI

*Ariadne Argyraki is an associate professor of geochemistry at the National and Kapodistrian University of Athens, Greece. An academic geochemist with over twenty years of experience teaching undergraduate and postgraduate programmes. She has been committed to the academic pathway starting with postdoctoral experience in the UK, followed by volunteer teaching and curriculum development in Africa until appointment to the NKUA, Greece. Her research interests are centered on environmental geochemistry, specifically the study of factors contributing to enhanced environmental mobility of trace elements by combining geochemical data with mineralogy and spatial analysis techniques. Research also extends to the quantification of measurement uncertainty during sampling and analysis - a horizontal theme that applies in all research topics*



### Vicky BARWICK

*After studying chemistry at the University of Nottingham, Vicki joined LGC in 1990 as an analytical chemist. She then worked on projects funded by the UK government's Valid Analytical Measurement (VAM) programme, focusing on the development of approaches to evaluating measurement uncertainty in chemical analysis. This work led to the development of training courses on uncertainty evaluation and wider quality assurance issues. Vicki is currently the Head of Commercial Training at LGC and has over 20 years' experience in the development and delivery of training courses in the area of analytical quality assurance. She has produced a wide range of training materials and is co-author of the books 'Quality assurance in analytical chemistry' and 'Practical statistics for the analytical scientist'. She is the Vice-Chair of Eurachem and Chair of the Eurachem Education and Training Working Group.*



### Ricardo BETTENCOURT DA SILVA

*After working in accredited laboratories as analyst and consultant for 15 years, started a research and teaching career at the University of Lisbon. Since 2002, collaborates with the Portuguese Accreditation Body, as technical assessor, and trains staff of laboratories. Ricardo is currently the secretary of CITAC, member of the executive board, chair of the working group on Qualitative Analysis and member of working group on Measurement Uncertainty and Traceability of Eurachem. He is co-editor of the Eurachem/CITAC guide for Setting the Target Measurement Uncertainty. His research interests are Metrology and Examinology in chemistry, the sciences of measurements and qualitative analysis in chemistry, respectively (<http://webpages.fc.ul.pt/~rjsilva/>)*



### Laurence BILHAM

*Lawrence Bilham has been an Assessment Manager for the United Kingdom Accreditation Service since 2008, specialising in water sampling. Prior to this, he worked in the water industry for ten years, initially in an analytical laboratory, and later managing a large sampling team taking potable and wastewater samples to meet regulatory and operational requirements of the water company. Lawrence graduated from the University of Sussex in 1996 with a BSc in Environmental Science.*



### Stephen ELLISON

*Dr Ellison is a Science Fellow at LGC, Teddington, the UK National Measurement Laboratory for chemical and biological measurement. He is Chair of the Eurachem Measurement Uncertainty and Traceability Working group. As a co-author of the EURACHEM guides “Quantifying Uncertainty in Analytical Measurement” and “Traceability in Chemical Measurement”, he is a recognized international expert in measurement uncertainty principles applied to analytical methods. He contributes to a range of ISO, CEN, BSI and other committees involving applications of statistics applied to measurement, including the JCGM Working Group responsible for the GUM. He has also contributed to IUPAC Technical Reports on Recovery, Validation, and Proficiency Testing of analytical chemistry laboratories.*



### Bertil MAGNUSSON

*Bertil Magnusson is currently working as a consultant for Trollboken AB ([www.trollboken.se](http://www.trollboken.se)). He is Secretary of the Eurachem Measurement Uncertainty and Traceability Working group. Formerly at RISE, Research Institute of Sweden with main focus on Metrology in Chemistry, a research area on international comparability and traceability of chemical measurement results. His background is environmental elemental analysis in natural water as well as long experience from industry. A major part of his current work is teaching and writing guidelines and research papers regarding measurement quality. Important part of his work is dedicated education for analytical laboratories in QA/QC. In Nordic cooperation he has been one of the authors of Handbooks on Measurement Uncertainty, Nordtest report 537, on Internal Quality Control, Nordtest report 569 and on Uncertainty from sampling Nordtest report 604 ([www.nordtest.info](http://www.nordtest.info)).*



### Teemu NÄYKKI

*Dr. Teemu Näykki is working as Principal Metrologist in Finnish Environment Institute (SYKE), Finland and also acting as a Visiting Associate Professor at University of Tartu, Estonia. He is responsible for SYKE accredited calibration laboratory and activities of Designated Institute for Finnish National Metrology Institute. Dr. Näykki is also a chairman of Finnish mirror groups for water quality methods standardization in ISO and CEN frameworks and also one of the authors of Nordtest uncertainty guide TR537 and designer of MUKIT for uncertainty estimation. He is a member Eurachem MUWG as well as the board of Eurachem Finland.*



### Erik OEHLenschläGER

*After working as an associate professor at Copenhagen Engineering College, Erik joint DANAK as a lead assessor in 2001 and was Manager of section for accreditation of laboratories 2003-2016. Besides acting as lead assessor since 2001 the work has involved training of assessors to ISO/IEC 17025 and ISO 15189 and training projects abroad in Cyprus, Serbia and Lithuania. He participated in the EA Laboratory Committee 2003-2016 and other EA and ILAC committees and was convener for ILAC P10 and P14 when they were issued. He was elected chair of the ILAC Accreditation Committee (AIC) in 2016 and now serves his 2<sup>nd</sup> term as chair. Erik has a MSc in Physics and a BSc in mathematics and is the author of several textbooks for high school and engineering education.*





### **Prof. Michael H. RAMSEY**

*Michael H. Ramsey FRSC CChem is now an Emeritus Professor at University of Sussex, where he's been for 20 years. After degrees in Chemistry & Geology, Mineral Chemistry and Analytical Geochemistry, he worked for 3 years in the Mining Industry in Zambia, and then 20 years in research and lecturing posts at Imperial College, London. He has published over 160 scientific papers, many on aspects of uncertainty of measurement arising from field sampling, and the effects of this uncertainty on decision making. Mike is Chair of the Working Group on Uncertainty from Sampling, and co-editor of the recent Eurachem/Eurolab/Citac/Nordtest/AMC Guide on this subject, available at <http://www.eurachem.org/index.php/publications/guides/musamp>*



### **Peter ROSTRON**

*Peter Rostron gained his PhD at the University of Sussex and is now a freelance researcher in statistical methods with a particular interest in the estimation of uncertainties in chemical measurements. He is a member of the RSC Analytical Methods Committee (AMC) working groups on Statistics and Sampling Uncertainty & Sampling Quality. Peter has a background in analytical chemistry and computer programming which he applies to his research, and also to developing statistical computer applications provided by the AMC. Current research includes the estimation of confidence limits on robust variances using a bootstrapping method. He was a co-editor of the 2nd edition of the Eurachem Guide on Uncertainty from Sampling.*



### **Adriaan VAN DER VEEN**

*Adriaan van der Veen obtained a PhD in physical chemistry (1997) and has worked since 1994 for VSL, the National Metrology Institute of the Netherlands. He is currently Chief Scientist for Chemistry and specialised in the general aspects of gas metrology. He has coordinated several key comparisons and proficiency tests, is an expert in reference material production, proficiency testing, and the evaluation of measurement uncertainty. He is a member of various standardisation committees and chairman of ISO/TC158 Analysis of Gases. He has joined JCGM WG1 ('GUM' working group) in 2008 and is currently leading the development of the New Perspective to the GUM and the revision of the Introduction to the GUM (JCGM 104:2009).*



### **Prof. Wolfhard WEGSCHEIDER**

*Wolfhard Wegscheider is em. Professor of General and Analytical Chemistry at the Montanuniversitaet Leoben, Austria. He received his education from the Graz University of Technology majoring in Technical Chemistry with a specialisation in Biochemistry and Food Chemistry. His thesis was in Analytical Chemistry with an emphasis on trace analysis and environmental analysis. As Fulbright Scholar he worked in Denver, CO, mainly on energy-dispersive X-ray fluorescence spectrometry. He is member of several learned societies such as GDCh, GOECh, CITAC and EURACHEM and the Working Group on Education and Training and the Working Group on Measurement Uncertainty and Traceability. In both, EURACHEM and CITAC he also served as Chairman. After a term as President he currently is Member of the Board of Directors of the Austrian Society of Analytical Chemistry – ASAC. In 2010 he has been appointed Fellow of the International Union of Pure and Applied Chemistry (IUPAC). From 1995 to 2001 he served as Dean of Graduate Studies of Montanuniversitaet Leoben, and from 2003 to 2011 as Rektor (President) of this Institution and as Chair of the Board of Trustees of OeAD GmbH, the Austrian Agency for International Cooperation in Education and Research until 2019.*