

Telling the measurement story: METAS publications and papers

The research and development work is also reflected in publications and papers authored or presented to a live audience by METAS researchers.

In 2015, METAS personnel again presented the results of their research and development work at symposiums, conferences and in scientific publications. They collaborated in specialist organisations and committees at national and international levels, contributing their know-how and experience there. They made metrology accessible to a wide audience including those beyond the immediate specialist group and were actively involved in courses for students at universities.

Measurement, a constantly recurring theme

METAS personnel authored over 30 publications and presented more than 40 papers in 2015. A series of lectures was also given in the course of events at METAS itself.

In 2015, METAS published two issues of “METinfo”, the technical journal for metrology. The articles are as a general rule written by METAS personnel. Several “METinfo” articles were taken up by trade journals from different areas.

Raising enthusiasm for measuring

METAS participated in the “Research live” anniversary programme of the Swiss Academy of Natural Sciences (200 years ScNat) in Bern. On the occasion of the Year of the light, the optics laboratory, in collaboration with the Schweizer Licht Gesellschaft (SLG), held a seminar on light measurement on November 12, 2015. The event met with great interest and was quickly sold out. Like last year, METAS participated in the “Girls – Technology – Lets go” programme during the national future day, which took place on 12 November, 2015.

Alongside these events, approximately 20 visits were carried out for groups of over a total 500 people. Visits enable a direct insight into the activities of METAS and, above all, in the work in the laboratories and the development of METAS measuring devices. These in turn impart a strong and lasting impression and help in awakening understanding of our activities.

Publications and Papers

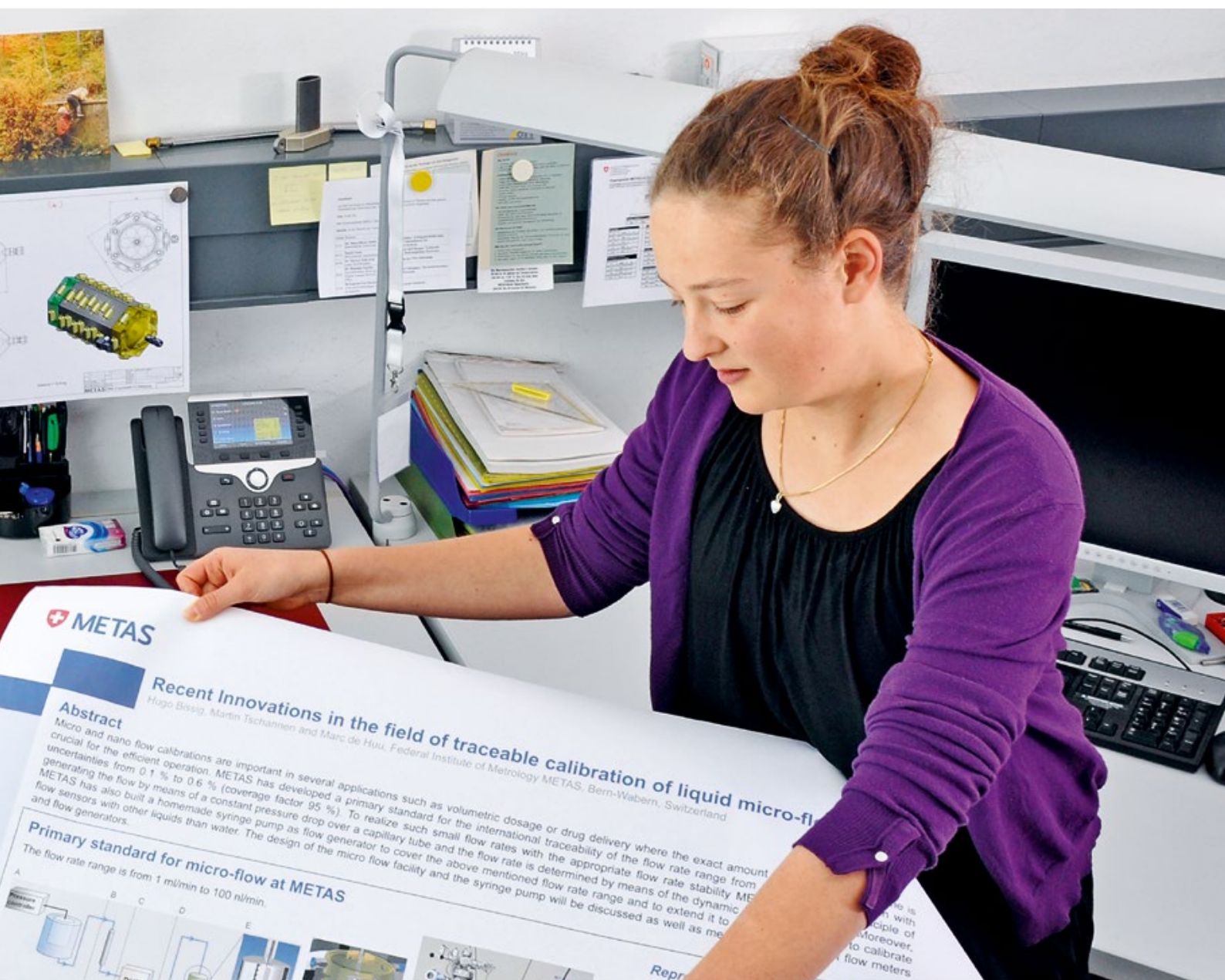
The list below provides an overview of the most important publications authored by METAS personnel and the papers presented by them. When giving the authors' names, those of the METAS employees are shown in bold.

Publications: Technical articles

- H. Baumann, F. Pythoud, D. Blas, S. Sibiryakov, A. Eichenberger** and E. E. Klingelé: *Experimental assessment of the speed of light perturbation in free-fall absolute gravimeters*. Metrologia 52, 2015, pp. 635–645.
- H. Bissig** et al.: *Primary standards for measuring flow rates from 100 nl/min to 1 ml/min – gravimetric principle*. Biomed. Eng.-Biomed. Tech. 60, 2015, pp. 301–316.
- H. Bissig, M. Tschannen, M. de Huu**: *Micro-flow facility for traceability in steady and pulsating flow*. Flow Measurement and Instrumentation 44, 2015, pp. 34–42.
- J. Hoffmann, M. Wollensack, J. Rufenacht, M. Zeier**: *Extended S-parameters for imperfect test ports*. Metrologia 52, 2015, pp. 121–129.
- C. Gomà, **B. Hofstetter-Boillat, S. Safai, S. Vörös**: *Experimental validation of beam quality correction factors for proton beams*. Phys. Med. Biol. 60, 2015, pp. 3207–3216.
- A. Küng, A. Nicolet, F. Meli**: *Study of wear of diamond-coated probe tips when scanning on different materials*. Meas. Sci. Technol. 26, 2015, 084005 (7 p.).
- D. Lachat**: *Average Speed Control*. Bulletin OIML 56 (1), 2015, pp. 28–31.
- K. Marti, S. Russi, P. Fuchs**: *Traceability of mass II: a study of procedures and materials*. Metrologia 52, 2015, pp. 89–103.
- S. Davidson, J. Verry, **K. Marti**: *Practical requirements for the successful implementation and subsequent dissemination of the redefined kilogram*. Vacuum 120, 2015, pp. 139–146.



- A. Mindel, S. Perrin, A. Marti**: *Pektolytische Enzyme und Methanolbildung in Obstmaischen*. Schweizer Zeitschrift für Obst- und Weinbau (SZOW), 2015, 2, pp. 9–12.
- C. Pascale, B. Niederhauser**: *Herstellung rückführbarer Kalibriergasgemische mittels gravimetrischer Messung von Permeationsprozessen*. Rubotherm, FluiPROP Application note, 2015 (2p.).
- C. Pascale, B. Niederhauser**: *Preparation of SI Traceable Calibration Gases by Gravimetric Measurement of a Permeation Process*. Rubotherm, FluiPROP Application note, 2015 (2p.).
- R. Thalmann, D. Kündig**: *Which diameter matters? MacroScale*. Recent developments in traceable dimensional measurements 2015, 810.20150325D (10p.).
- V. Mudronja, V. Šimunovic, B. Acko, M. Matus, E. Bánréti, D. István, **R. Thalmann** et al.: *Final report on EURAMET.L-S21: Supplementary comparison of parallel thread gauges*. Metrologia 52, 2015, Tech. Suppl., 04003.



Preparing papers: a poster in print.

M. McEwen, P. Sharpe, S. Vörös: *Evaluation of alanine as a reference dosimeter for therapy level dose comparisons in megavoltage electron beams*. Metrologia 52, 2015, pp. 272–279.
 C. Kessler, D. T. Burns, S. Vörös, B. Hofstetter-Boilat: *Key comparison BIPM.RI(1)-K4 of the absorbed dose to water standards of the METAS, Switzerland and the BIPM in ^{60}Co gamma radiation*. Metrologia 52, 2015, Tech. Suppl., 06002.
 M. Zeier: *Messunsicherheiten in der Vektornetzwerkanalyse. Die neue Richtlinie EURAMET cg-12. Messunsicherheit praxisgerecht bestimmen*, VDI Berichte 2269, 2015, pp. 29–38.

Publications: Conference proceedings

H. Baumann, A. L. Eichenberger, B. Jeckelmann et al.: *The Metas Watt Balance Mark II : First Results*. Proceedings XXI IMEKO World Congress «Measurement in Research and Industry», Prag, August 30 to September 4, 2015.
 H. Bissig, M. Tschannen, M. de Huu: *Primary Standard in Micro Flow for Traceability in Steady and Pulsating Flow Regime*. 9th ISFFM (International Symposium of Fluid Flow Measurements) Arlington, Virginia, April 14 to 17, 2015, (7p.).
 Ch. Bock: *Décision C-423/13 : 4^{ème} décision de la Cour de Justice de l'Union Européenne sur la directive sur les instruments de mesure et les dispositifs intelligents*. 17th International Congress of Metrology, 2015, 16002, pp. 1–5.

Ch. Bock: *Der Umgang des Staates mit «technischen» Normen*. F. Uhlmann (Hrsg.), Private Normen und staatliches Recht. 14. Jahrestagung des Zentrums für Rechtsetzungslehre. Zürich/St. Gallen: Dike, 2015, pp. 21–59.
 J.-P. Braun, S. Siegenthaler: *The calibration of static and dynamic performances of PMUs*. 17th International Congress of Metrology, 2015, 12002, pp. 1–6.
 D. Corminboeuf: *Calibration of bridge standard for strain gauge bridge amplifier*. 17th International Congress of Metrology, 2015, 04004, pp. 1–5.
 S. Dash, F. Pythoud et al.: *Traceable Power Measurement of LTE Signals*. 17th International Congress of Metrology, 2015, 12005, pp. 1–6.
 J. Hoffmann, M. Wollensack, J. Ruefenacht, M. Zeier: *Comparison of Methods for Measurement of Equivalent Source Match*. Proceedings of the 45th European Microwave Conference, 2015, pp. 730–733.

M. de Huu, B. Wüthrich: *The Hydrometric Calibration Facility from METAS: A Primary Standard for Liquid Flow Speed.* 9th ISFFM (International Symposium of Fluid Flow Measurements) Arlington, Virginia, April 14 to 17, 2015, (7p.).

F. Meli: *Economic high resolution fringe counting for heterodyne interferometers using FPGA technology.* MacroScale. Recent developments in traceable dimensional measurements 2015, 810.20150325E.

P. Richard: *The redefinition of the SI in 2018 and the present status for the kilogram.* Keynote speaker. Proceedings XXI IMEKO World Congress «Measurement in Research and Industry», Prag, August 30 to September 4, 2015.

H.-P. Vaterlaus, X. Li: *Control of quantity of prepackages: New statistical multistep sampling procedure.* 17th International Congress of Metrology, 2015, 02013, pp. 1–3.

Papers (without publicised proceedings)

H. Baumann: *Status of the METAS Watt balance.* CCM WGR-kg, BIPM, Paris, 24.2.2015.

H. Bissig: *Calibration Services for Health Care.* MeDD Symposium, Utrecht, the Netherlands, 22.5.2015.

J.-P. Braun: *The metrological characterisation of PMUs.* IEEE Italy, Section school on future energy systems, Trento, 27.1.2015.

J.-P. Braun: *The calibration of static and dynamic performances of PMUs.* CIM Paris, 24.9.2015.

J.-P. Braun: *Metrological characterisation of PMUs.* Workshop on PMU metrological requirement, Quality infrastructure for renewable energy sources & energy efficiency in Latin America and the Caribbean, Bent Goncalvez, Rio Grande do Sul, 27.11.2015.

J.-P. Braun: *PMU in distribution networks.* Workshop on PMU metrological requirement, Quality infrastructure for renewable energy sources & energy efficiency in Latin America and the Caribbean, Bent Goncalvez, Rio Grande do Sul, 27.11.2015.

D. Corminboeuf: *Calibration of bridge standards for strain gauge bridge amplifiers.* CIM Paris, 22.9.2015.

S. Dash: *Traceable Power Measurement of LTE Signals.* 17th International Congress of Metrology, 2015, Paris, 24.9.2015.

J. Hoffmann: *Nearfield Scanning Microwave Microscopes.* EURAMET TCEM SC-RF&MW Meeting, Istanbul, 14.4.2015.

J. Hoffmann: *2.92 mm Offset Short Calibration.* Keysight Metrology Workshop, Istanbul, 16.4.2015.

J. Hoffmann: *Connector Effect and Ripple Method.* Keysight Metrology Workshop, Istanbul, 16.4.2015.

J. Hoffmann: *Comparison of Source Match Measurements.* European ANAMET Seminar, METAS, Wabern, 3.6.2015.

J. Hoffmann: *Comparison of Source Match Measurements.* European Microwave Conference, Paris, 9.9.2015.

J. Hoffmann: *1.0 mm Offset Short Calibration.* European ANAMET Seminar, Paris, 12.12.2015.

A. Küng: *Friction and wear of diamond coated microprobes.* euspen, Micro/Nano Manufacturing Workshop, NPL, Teddington, 25.11.2015.

D. Leuenberger et al.: *On Development and Characterisation of a Portable Standard Gas Generator.* GAS 2015, Rotterdam, 9.6.2015. [Best Poster Award]

K. Marti: *A study of materials and procedures for future mass standards: latest results at METAS.* Working Group Mass, BIPM, Paris, 24.2.2015.

F. Meli: *Virtual model of a μ -CMM.* Workshop on methods of uncertainty determination for computed tomography in dimensional metrology, FMT-FAU Erlangen, 28.1.2015.

F. Meli: *Intercomparison of reference materials.* Workshop on metrological characterization of microvesicles, VSL, Delft, 28.5.2015.

F. Meli: *Virtual micro-CMM: Application to complex parameter based shapes.* euspen, Micro/Nano Manufacturing Workshop, NPL, Teddington, 25.11.2015.

C. Pascale: *Metrology at METAS in support for Atmospheric Science.* Meeting GAW-CH Landesauschuss, Zürich-Kloten, 13.5.2015.

C. Pascale: *New activities in the METAS Gas Laboratory for Essential Climate Variables.* GAS 2015, Rotterdam, 11.6.2015.

B. Niederhauser: *EMRP ENV55 MetNH₃: Towards a Consistent Metrological Infrastructure for Ammonia Measurements.* GAS 2015, Rotterdam, 11.6.2015.

F. Pythoud: *Introduction to EMC.* EMV-Fachtagung, Kloten, 21.1.2015.

P. Richard: *Revision of the International System of Units (SI) and consequences for the kilogram.* PTB Kolloquium, Braunschweig, 20.1.2015.

P. Richard: *The present situation with the CCM roadmap for a redefinition of the kilogram in 2018.* Seminar on the redefinition of the kilogram, Xi'an, China, 15.7.2015.

P. Richard: *The CCM roadmap for a redefinition of the kilogram in 2018.* 2015 NCSL International Workshop & Symposium «Measurement Science and the Quality of Life», Grapewine, Texas, 22.7.2015.

J. Rüfenacht: *Practical Hints: Splitter Characterization.* European ANAMET Seminar, METAS, Wabern, 3.6.2015.

E. Tas: *A new Conducted Immunity Test Device for Interlaboratory Comparison.* EMC Europe, Dresden, 20.8.2015.

R. Thalmann: *Welcher Durchmesser passt? 6.* Swissmem Seminar «Dimensionelle Messtechnik», Winterthur, 10.3.2015.

R. Thalmann: *METAS-SAS: Organisation, Aufgaben.* 6. Versammlung Swissmem-Fachgruppe «Dimensionelle Messtechnik», Egerkingen, 15.4.2015.

R. Thalmann: *Principles and Applications of Dimensional Metrology.* IGSM Summerschool on Metrology, Drübeck, 25.8.2015.

R. Thalmann: *Präzisionskoordinatenmesstechnik – Neue Entwicklungen zur Rückführung von Messergebnissen.* Fachtagung Produktionsmesstechnik, NTB Buchs, 3.9.2015.

R. Thalmann: *E-Zertifikate und digitale Signatur.* EUROLAB-CH / SNV Seminar Dokumentenmanagement im Labor, Winterthur, 18.11.2015.

K. Vasilatou: *Heterogeneously nucleated particles as a reference calibration aerosol according to ISO 27891.* Particulate Workshop (GAWG), BIPM, Paris, 15.4.2015.

M. Wollensack: *VNA Tools: Splitter Characterization.* European ANAMET Seminar, METAS, Wabern, 3.6.2015.

M. Zeier: *ECU Stability Tests.* EURAMET TCEM SC-RF&MW Meeting, Istanbul, 14.4.2015.

M. Zeier: *A simplified method of VNA uncertainty estimation.* EURAMET TCEM SC-RF&MW Meeting, Istanbul, 14.4.2015.

M. Zeier: *The revision of EURAMET Guide cg-12.* EURAMET TCEM Meeting, Sarajewo, 15.10.2015.

M. Zeier: *Measurement Uncertainties in Vector Network Analysis – The New Guideline EURAMET cg-12.* VDI Fachtagung Messunsicherheit 2015, Braunschweig, 17.11.2015.