

3rd international Workshop on
Measuring Techniques for Liquid Metal Flows
(MTLM 2015)
Final Programme



April 15 – 17, 2015

Dresden, Germany



Tuesday, April 14th

17:00 - 21:00 Registration

19:00 - 21:00 Welcome reception

Lab tour at HZDR

- **Tuesday, April 14th, 13:00 - 16:00**

The bus will depart from the Quality Hotel Plaza Dresden at **13:30** for the trip to the HZDR laboratory and will be back at the Hotel at about **17:00**.

- **Friday, April 17th, 17:00 - 19:00**

The bus will start from the Quality Hotel Plaza Dresden at **16:30** for the trip to the Lab visit. The bus will return to the hotel at about **19:00**.

Posters

The posters will be positioned in the back of the conference room and can be discussed during the coffee breaks.

- **Flow pattern of GaInSn liquid on inclined stainless steel plate under magnetic field using visualization method**
J. C. Yang, T. Y. Qi, M. J. Ni, Z. H. Wang (*School of Physics, University of the Chinese Academy of Sciences, Beijing 100049, P.R. China*)
- **High Temperature Liquid Metals to be used in Energy Technology**
W. Hering, W. Jäger, A. Onea, N. Diez de los Rios Ramos, R. Stieglitz, P. Moster, M. Lux, S. Scherrer (*Karlsruhe Institute of Technology, Germany*)
- **Towards in-situ fibre-optic measurements of temperature and flow-induced vibration in lead bismuth eutectic**
B. De Pauw^{1,2}, G. Kennedy¹, K. Van Tichelen¹, S. Vanlanduit², F. Berghmans² (¹*Belgian Nuclear Research Centre (SCK CEN), Boeretang 200, Mol, Belgium*, ²*Vrije Universiteit Brussel (VUB), Pleinlaan 2, Brussels, Belgium*)
- **Diagnostic tool for MHD PbLi loop at UCLA**
C. Courtessole¹, S. Smolentsev¹, S. Sahu², M. Abdou¹ (¹*Fusion Science and Technology Center, University of California, Los Angeles, USA*, ²*Institute for Plasma Research, Gandhinagar 382428, Gujarat, India*)
- **Operation of EM Induction Permanent Magnets Pump as Flow Meter**
I. Bucenieks (*Institute of Physics, University of Latvia*)
- **Current Status of R&D in Liquid Metal Diagnostics Development for Indian LLCB TBM**
A. Deoghar¹, S. Sahu¹, A. Saraswat¹, T.S. Rao¹, S. Verma¹, A. Ranjan¹, A. Prajapati¹, V. Mehta¹, R. Bhattacharyay¹, P. Das² (¹*Institute for Plasma Research, Bhat, Gandhinagar, Gujarat - 382 428*, ²*Bhabha Atomic Research Center, Trombay, Mumbai - 400 085*)
- **Simplified method for electromagnetic detection of gas bubbles in liquid metals**
O. Andreev, T. Wondrak, T. Gundrum, S. Eckert (*Helmholtz-Zentrum Dresden-Rossendorf, Germany*)
- **Ultrasound velocimetry in high current driven liquid metal flow**
M. Starace, N. Weber, M. Seilmayer, C. Kasprzyk, F. Stefani, T. Weier, S. Eckert (*Helmholtz-Zentrum Dresden-Rossendorf, Germany*)
- **Liquid metal laboratory in Research Center Rez**
J. Dámer (*Research center Rez, L.T.D Husinec - Rez 130, 250 68, Czech republic*)

Wednesday, April 15th

8:30 Registration

9:00 Opening, welcome

9:30 **Keynote lecture: Ultrasound Doppler measurements in liquid metal flows**
Y. Tasaka (*University of Sapporo, Japan*)

10:10 **Modular Ultrasound Array Doppler Velocimeter with FPGA-based Signal Processing for Flow Mapping in Liquid Metals**
R. Nauber¹, N. Thieme¹, H. Beyer¹, L. Büttner¹, D. Rübiger², S. Franke², S. Eckert², J. Czarske¹ (¹*Technical University of Dresden, Germany*, ²*Helmholtz-Zentrum Dresden-Rossendorf, Germany*)

10:30 **Flow measurements in heavy liquid metals using the ultrasound Doppler method**
S. Franke, T. Gundrum, G. Gerbeth, S. Eckert (*Helmholtz-Zentrum Dresden-Rossendorf, Germany*)

10:50 Coffee break

Session 1: Ultrasound Doppler Velocimetry I

11:20 **Application of ultrasonic probes with acoustic wave guides for flow measurements**
J-C. Willemetz¹, T. Gundrum², G. Gerbeth², S. Eckert² (¹*Signal Processing, Switzerland*, ²*Helmholtz-Zentrum Dresden-Rossendorf, Germany*)

11:40 **Measuring and studies on the behavior of fluid flow and gas bubbles distribution in the continuous casting mold with injected argon gas and a traveling magnetic field**
Z. Chen, X. Xu, Z. Li, E. Wang (*Northeastern University, Shenyang, Liaoning, China*)

12:00 **How to circumvent electromagnetic noise in liquid metal experiments with high magnetic fields**
M. Seilmayer, F. Stefani, T. Gundrum (*Helmholtz-Zentrum Dresden-Rossendorf, Germany*)

12:20 Lunch

Session 2: Ultrasound Doppler Velocimetry II

- 14:00 **Application of the ultrasound Doppler velocimetry in model experiments for casting and solidification**
D. Rübiger, T. Vogt, K. Timmel, B. Willers, J. Pal, G. Gerbeth, S. Eckert (*Helmholtz-Zentrum Dresden-Rossendorf, Germany*)
- 14:20 **Acoustic streaming in liquids: scaling and dimensional analysis**
V. Botton¹, B. Moudjed², D. Henry¹, H. Ben Hadid¹, J.-P. Garandet², A. Potherat³
(¹*Université de Lyon, France*, ²*CEA-Saclay, France*, ³*Coventry University, UK*)
- 14:40 **Measuring the diameter of rising gas bubbles by means of the ultrasound transit time technique**
T. Richter, K. Eckert, S. Odenbach (*Technical University of Dresden, Germany*)
- 15:00 **Ultrasound Doppler measurements in liquid metal two-phase flows**
T. Vogt, E. Strumpf, G. Gerbeth, S. Eckert (*Helmholtz-Zentrum Dresden-Rossendorf, Germany*)
- 15:20 Coffee break

Session 3: Radiographic methods

- 15:50 **Measurements of Bubbles in Liquid Mercury for SNS Target Applications**
M. W. Wendel (*Oak Ridge National Laboratory, USA*)
- 16:10 **Dynamic Neutron Radiography Visualization of Inclusions in Liquid Metal**
M. Ščepanskis¹, M. Sarma², K. Thomsen³, A. Jakovičs¹, R. Nikoluškins², T. Beinerts²,
P. Vontobel³, A. Bojarevičs², E. Platacis² (¹*University of Latvia, Riga*, ²*University of Latvia, Salaspils*, ³*Paul Scherrer Institute, Switzerland*)
- 16:30 **Visualization of liquid metal bubbly flows using the X-ray radioscopy**
O. Roshchupkina, N. Shevchenko, E. Strumpf, K. Timmel, S. Eckert (*Helmholtz-Zentrum Dresden-Rossendorf, Germany*)
- 16:50 **Corresponding Relationship of Dendrites Deflection with the Fluid Velocity at the Solidification Front**
S. Wang¹, G. Alvarez de Toledo², S. Louhenkilpi¹ (¹*Aalto University, Finland*, ²*Gerdau Investigación y Desarrollo Europe, Spain*)
- 17:10 **Detection of melt flow in solidifying metal alloys by X-rays**
N. Shevchenko, O. Roshchupkina, S. Eckert (*Helmholtz-Zentrum Dresden-Rossendorf, Germany*)
- 17:30 **High-temperature experimental studies of surface properties of metal melts**
Yu. Plevachuk, V. Sklyarchuk, M. Lytvyn, S. Mudry (*Ivan Franko National University, Lviv, Ukraine*)

Thursday, April 16th

Session 4: Sodium-cooled fast reactor (SFR)

- 8:30 **Keynote lecture: ASTRID project**
C. Latgé (*CEA Cadarache, France*)
- 8:50 **Keynote lecture: R&D on SFR instrumentation**
J.-P. Jeannot (*CEA Cadarache, France*)
- 9:10 **ICMM sodium loop**
R. Khalilov, I. Kolesnichenko, P. Frick, A. Mamykin, A. Pavlinov, A. Shestakov, A. Vasilyev (*Institute of Continuous Media Mechanics, Perm, Russia*)
- 9:30 **Measurement Techniques and Results in Tesla-EMP Facility**
L. Goldsteins^{1,2,3}, L. Buligins², Y. Fautrelle³, C. Biscarrat¹, E. Platacis⁴ (¹*CEA Cadarache, France*, ²*University of Latvia*, ³*Grenoble INP, SIMAP/EPM Laboratory, France*, ⁴*Institute of Physics, University of Latvia, Salaspils, Latvia*)
- 9:50 **Quantitative void fraction measurements with an eddy current flowmeter for 4th generation Sodium cooled Fast Reactor**
M. Kumar^{1,2}, W. Bergez¹, Ph. Tordjeman¹, M. Cavarro², K. Paumel², J.P. Jeannot² (¹*Université de Toulouse, France*, ²*CEA Cadarache, France*)
- 10:10 **Contactless inductive bubble detection in a liquid metal column**
T. Gundrum¹, P. Büttner², B. Dekdouk³, A.J. Peyton³, T. Wondrak¹, V. Galindo¹, S. Eckert¹ (¹*Helmholtz-Zentrum Dresden-Rossendorf, Germany*, ²*Technical University of Dresden, Germany*, ³*University of Manchester, UK*)
- 10:30 Coffee break

Session 5: Lead-cooled fast reactor (LFR)

- 11:00 **Keynote lecture: The Advanced Lead Fast Reactor European Demonstrator (ALFRED) Project**
L. Mansani (*Ansaldo Nucleare, Genova, Italy*)
- 11:20 **Keynote lecture: R&D on LFR Instrumentation**
M. Carta (*ENEA, Rome, Italy*)
- 11:40 **Technical Requirements of Velocity Profile Measurement for Liquid Lead-Alloys**
H. Wang¹, J. He^{1,2}, H. Shang¹, Z. Zhu¹, Q. Huang¹ (¹*Institute of Nuclear Energy Safety Technology, Chinese Academy of Sciences, Hefei, Anhui, China*, ²*University of Science and Technology of China, Hefei, Anhui, China (FDS team)*)

12:00 **Preliminary Test on the Flowrate and Temperature measurement for Heat transfer experiment of Rod Bundle in KYLIN-II**
K. Lyu, L. Chen, C. Yue, S. Gao, Q. Huang (*Chinese Academy of Sciences, Hefei, Anhui, China*)

12:20 Lunch

Session 6: Gas-cooled fast reactor (GFR) / Fundamentals

14:00 **Keynote lecture: ALLEGRO instrumentation**
L. Belovsky (*ÚJV Řež, a.s., Husinec, Czech Republic*)

14:40 **From fundamental research on liquid metals and alloys to applications**
J.-G. Gasser (*LCP-A2MC Université de Lorraine, France*)

15:00 **“Molten metals are Non-Newtonian” – Fact or Artefact?**
R. Ritwik, P. N. Quested (*Brunel University Uxbridge Middlesex, UK*)

15:20 Coffee break

Session 7: Local probes

15:50 **Experimental study of single bubble motion in a liquid metal with a strong horizontal magnetic field**
Z. H. Wang, J. C. Yang, M. J. Ni, S. D. Wang (*University of the Chinese Academy of Sciences, Beijing, China*)

16:10 **Monitoring of Meniscus Level Fluctuation of Liquid Sn-Pb-Bi Alloy Using a Laser Displacement Sensor and Analysis of Meniscus Behavior**
X. Xu^{1,2}, A. Deng¹, X. Zhang¹, E. Wang¹ (¹*Northeastern University, Shenyang, China*,
²*Technical University of Ilmenau, Germany*)

16:30 **Sensors and methods for local measurements in non-isothermal turbulent liquid metal flow**
L. Genin¹, I. Belyaev², V. Sviridov², E. Sviridov², Yu. Ivochkin², N. Razuvanov², V. Zagorsky², S. Krilov¹ (¹*Moscow Power Engineering Institute, Russia*, ²*Joint Institute for High Temperatures RAS, Russia*)

16:50 **Calibration of potential probes for measuring velocity profiles in liquid metal MHD duct flows**
V. Chowdhury (*Karlsruhe Institute of Technology, Germany*)

- 17:10 **Cross-Correlation Velocimetry applied to Convective and Forced Turbulent Flows of liquid sodium**
A. Mamykin, R. Khalilov, I. Kolesnichenko, A. Pavlinov, P. Frick (*Institute of Continuous Media Mechanics, Perm, Russia*)
- 17:30 **Probe methods of 3D velocity and temperature measurements in liquid metal flow**
L. Genin¹, V. Sviridov², N. Razuvanov², I. Belyaev², N. Pyatnitskaya² (¹*Moscow Power Engineering Institute, Russia*, ²*Joint Institute for High Temperatures RAS, Russia*)
- 17:50 **Probe measurements and direct numerical simulation of specific modes of MHD heat transfer**
V. Sviridov¹, E. Sviridov¹, I. Belyaev², O. Zikanov³, Ya. Listratov¹, D. Ognerubov¹, I. Melnikov², I. Poddubny¹ (¹*Moscow Power Engineering Institute, Russia*, ²*Joint Institute for High Temperatures RAS, Russia*, ³*University of Michigan, USA*)
- 19:30 Conference dinner

Friday, April 17th

Session 8: Inductive methods I

- 8:30 **Keynote lecture: Lorentz Force Velocimetry**
A. Thess (*German Aeronautics and Space Research Centre, Germany*)
- 9:10 **Lorentz Force Velocimetry at high speed liquid sodium flow**
I. A. Sokolov¹, V. I. Noskov², A. M. Pavlinov², Y. B. Kolesnikov¹ (¹*Technical University of Ilmenau, Germany*, ²*Institute of Continuous Media Mechanics, Perm, Russia*)
- 9:30 **Recent developments on the contactless inductive flow tomography**
T. Wondrak, M. Ratajczak, F. Stefani, T. Gundrum, K. Timmel, J. Pal, S. Eckert (*Helmholtz-Zentrum Dresden-Rossendorf, Germany*)
- 9:50 **2D velocity measurement using local Lorentz Force Velocimetry**
D. Hernández¹, T. Wondrak², J. Schleichert¹, C. Karcher¹, A. Thess³ (¹*Technical University of Ilmenau, Germany*, ²*Helmholtz-Zentrum Dresden-Rossendorf, Germany*, ³*German Aeronautics and Space Research Centre, Germany*)
- 10:10 Coffee break

Session 9: Inductive methods II

- 10:40 **Keynote lecture: Metal flow imaging using a hybrid of electrical capacitance tomography and magnetic induction tomography**
M. Soleimani (*University of Bath, UK*)
- 11:20 **New developments on Lorentz Force Velocimetry for weakly conducting fluids**
R. Ebert, C. Resagk (*Technical University of Ilmenau, Germany*)
- 11:40 **Contactless Flow Rate Sensor for Heavy Liquid Metals**
D. Buchenau¹, J. Priede², S. Lenk³, S. Eckert¹, G. Gerbeth¹ (¹*Helmholtz-Zentrum Dresden-Rossendorf, Germany*, ²*Coventry University, UK*, ³*SAAS Ltd. Bannewitz, Germany*)
- 12:00 **Lorentz Force Particle Analyzer**
X.D. Wang¹, A. Thess², R. Moreau³, Y.Q. Tan¹, Z. Tao¹ (¹*University of the Chinese Academy of Sciences, Beijing, China*, ²*German Aeronautics and Space Research Centre, Germany*, ³*CNRS France*)

12:20 **Lorentz Force Sigmometry: A Novel Technique for Measuring Thermo-Physical Properties of Molten Metals**
S. Alkhalil¹, Y. Kolesnikov¹, A. Thess², T. Fröhlich¹ (¹*Technical University of Ilmenau, Germany*, ²*German Aeronautics and Space Research Centre, Germany*)

12:40 Lunch

Session 10: Inductive methods III

14:00 **Time-of-flight velocimetry of conductive liquids**
N. Dubovikova, Ch. Karcher, Y. Kolesnikov (*Technical University of Ilmenau, Germany*)

14:20 **Composite liquid metal flow measurement system**
A. Pavlinov, R. Khalilov, I. Kolesnichenko, A. Mamykin (*Institute of Continuous Media Mechanics, Perm, Russia*)

14:40 **Flow measurements in continuous casting models by means of contactless inductive flow tomography under the influence of electromagnetic brakes**
M. Ratajczak, T. Wondrak, F. Stefani, K. Timmel, S. Eckert (*Helmholtz-Zentrum Dresden-Rossendorf, Germany*)

15:00 **Analysis of high-speed lithium jet flow under vacuum conditions**
S. Gordeev, F. Groeschel, R. Stieglitz (*Karlsruhe Institute of Technology, Germany*)

15:20 **Liquid metal surface detection by depth of field information**
K. Litfin, A. Batta, F. Fellmoser, A. G. Class, Th. Wetzels (*Karlsruhe Institute of Technology, Germany*)

15:40 Closing