



2022 12TH IEEE International Workshop on
**Applied Measurements
for Power Systems**

September 28 - 30, 2022 | Cagliari, Italy



**AMPS 2022
WORKSHOP
PROGRAM**

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Welcome Message from the Chairmen

AMPS 2022, sponsored by the IEEE Instrumentation and Measurement Society and organized by the TC39 “Measurements in Power Systems”, is the 12th edition of the IEEE International workshop on Applied Measurements for Power Systems.

After missing the 2020 edition and holding the 2021 edition as virtual event, due to well-known restrictions caused by COVID pandemic, this year the AMPS workshop comes back to its original face-to-face formula and is hosted by the University of Cagliari, Italy.

This is the natural modality for this event, which has always privileged the intense discussion between attendees coming from different realities (academia, metrological institutes, research centers, and industry) over the mere presentations of the accepted papers.

The papers presented in these proceedings have been divided into ten homogeneous technical sessions, whose titles clearly reflect the “hot” trends in measurements applications for modern electric power systems. Therefore, besides the most recent advancements in the subjects typically considered in the previous editions of the workshop, such as power system monitoring, Phasor Measurement Units, voltage and current sensors, signal processing, harmonics and supraharmonics, power quality, and measurements on power system components, this year one session is specifically dedicated to measurements on DC power systems, one to data analytics and artificial intelligence, and another one to line parameters estimation.

As per tradition of this workshop, we hope this event will represent a qualified forum for providing high-level contributions to the advancement of the knowledge on these topics.

Welcome to AMPS 2022!

General Co-Chairs

Prof. Carlo Muscas, *University of Cagliari, Cagliari, Italy*

Prof. Lorenzo Peretto, *University of Bologna, Bologna, Italy*

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Wednesday, September 28

8:45 - 9:00

Welcome Address

Room: Stampace

09:00 - 11:00

Measurements on DC Power Systems

Session Chair: Sergio Toscani (Politecnico di Milano, Italy)

Room: Stampace

09:00

DC active electrical energy meters: Accuracy tests

Christian Mester (Federal Institute of Metrology METAS, Switzerland)

9:30

Development of a Transfer Standard for DC Power Quality Reference Systems

Guglielmo Frigo (Federal Institute of Metrology METAS, Switzerland)

Marco Agustoni (METAS, Switzerland)

10:00

Experimental results on automatic measurement system for fault recording and location in 3 kV DC railway overhead contact lines

Daniele Difino (Rete Ferroviaria Italiana, Italy)

Marco Camomilla (Rete Ferroviaria Italiana, Italy)

Eugenio Fedeli (Rete Ferroviaria Italiana, Italy)

10:30

Considerations on Voltage Ripple Assessment in DC Power Network

Giuliano Cipolletta (University of Campania Luigi Vanvitelli, Italy)

Antonio Delle Femine (University of Campania Luigi Vanvitelli, Italy)

Daniele Gallo (University of Campania Luigi Vanvitelli, Italy)

Carmine Landi and Mario Luiso (University of Campania Luigi Vanvitelli, Italy)

11:00 – 11:30

Break

11:30 – 13:00

Power System Monitoring

Session Chair: Mihaela Albu (Politehnica University of Bucharest, Romania)

Room: Stampace

11:30

Latency Characterization of a Wide Area Monitoring Protection and Control Application in the Italian Transmission System

Giacomo Gallus (University of Cagliari, Italy)

Paolo Castello (University of Cagliari, Italy)

Carlo Muscas (University of Cagliari, Italy)

Paolo Attilio Pegoraro (University of Cagliari, Italy)

Davide Sitzia (University of Cagliari, Italy)

Laura Campisano (Terna Rete Italia, Italy)

Giorgio Giannuzzi (Terna, Italy)

Camilla Maiolini (Terna, Italy)

Pietro Pau (Terna, Italy)

12:00

Analysis of a Power Distribution Network Multi-Area State Estimator with secure Blockchain-based data exchange

Cesar Andres Cazal (RWTH Aachen University & Institute for Automation of Complex Power Systems, Germany)

Marco Pau (Fraunhofer Institute for Energy Economics and Energy System Technology, Germany)

Ferdinanda Ponci (RWTH Aachen University, Germany)

Antonello Monti (RWTH Aachen University & Institute for Automation of Complex Power Systems, Germany)

12:30

Evaluating UWB for Wireless Clock Synchronization of an IEC 61850 Stand Alone Merging Unit

Stefano Rinaldi (University of Brescia, Italy)

Alessandro Depari (University of Brescia, Italy)

Paolo Ferrari (University of Brescia, Italy)

Alessandra Flammini (University of Brescia, Italy)

Elia Mondini (University of Brescia, Italy)

Alessandro Musatti (University of Brescia, Italy)

Marco Pasetti (University of Brescia, Italy)

Emiliano Sisinni (University of Brescia, Italy)

13:00 – 14:30

Lunch

14:30 – 16:00

Signal Processing for Power System Measurements

Session Chair: Julio Barros (University of Cantabria, Spain)

Room: Stampace

14:30

A Measurement-based Aggregated Simulation Model of Residential LV networks for Harmonic Resonance Studies

Shrinath Kannan (Technische Universität Dresden, Germany)

Jan Meyer (Technische Universität Dresden, Germany)

Peter Schegner (TU Dresden, Germany)

15:00

Gaussian Filters for P Class PMUs: a Performance Comparison of Alternative FIR Design Procedures

Xuansheng Shan (Hunan University, China)

David Macii (University of Trento, Italy)

He Wen (Hunan University & College of Electrical and Information Engineering, China)

Dario Petri (University of Trento, Italy)

15:30

Evaluation of composite voltage test parameters

Tim Christoph Schlüterbusch (Physikalisch- Technische Bundesanstalt, Germany)

Johann Meisner (Physikalisch-Technische Bundesanstalt, Germany)

Stephan Passon (Physikalisch-Technische Bundesanstalt, Germany)

Frank Gerdinand (Physikalisch-Technische Bundesanstalt, Germany)

16:00 – 16:30

Break

16:30 – 18:00

Voltage and Current Sensors

Session Chair: Roberto Tinarelli (University of Bologna, Italy)

Room: Stampace

16:30

Electric Field Immunity Test on Epoxy-Resin Capacitive Voltage Sensor in Smart Bushing

Abbas Ghaderi (University of Bologna, Italy)

Lorenzo Peretto (University of Bologna, Italy)

Mattewos Tefferi (G&W Electric Co., USA)

Elisa Scala (G&W Altea, Italy)

Andrea Nalli (G&W Altea, Italy)

17:00

Investigating and Modeling the Harmonic Measurement Accuracy of Current Transformers

Marco Faifer (Politecnico di Milano, Italy)

Christian Laurano (Politecnico di Milano, Italy)

Roberto Ottoboni (Politecnico di Milano, Italy)

Sergio Toscani (Politecnico di Milano, Italy)

Thursday, September 29

09:00 – 11:00

Phasor Measurement Units

Session Chair: Paolo Attilio Pegoraro (University of Cagliari, Italy)

Room: Stampace

09:00

The opportunity for synchrophasors in distribution networks

Johan Rens (North West University, South Africa)

09:30

Revision of target uncertainty for PMU-based distributed measurement systems in MV networks

Federica Costa (University of Bologna, Italy)

Alessandro Mingotti (University of Bologna, Italy)

Lorenzo Peretto (University of Bologna, Italy)

Roberto Tinarelli (University of Bologna, Italy)

Guglielmo Frigo (Federal Institute of Metrology METAS, Switzerland)

10:00

A Bi-objective Optimal PMU Placement Strategy Reconciling Costs and State Estimation Uncertainty

Riccardo Andreoni (University of Trento, Italy)

Amir Bashian (University of Trento, Italy)

Matteo Brunelli (University of Trento, Italy)

David Macii (University of Trento, Italy)

10:30

Open-Source MATLAB-Based PMU Library for HIL Applications Compliant with IEC/IEEE 60255-118-1

Chemseddine Allioua (University of Bologna, Italy)

Federica Costa (University of Bologna, Italy)

Alessandro Mingotti (University of Bologna, Italy)

Roberto Tinarelli (University of Bologna, Italy)

11:00 – 11:30

Break

11:30 – 13:00

Data Analytics and Artificial Intelligence

Session Chair: Guglielmo Frigo (Federal Institute of Metrology METAS, Switzerland)

Room: Stampace

11:30

Artificial Intelligence and Smart Grids: the Cable Joint Test Case

Virginia Negri (University of Bologna, Italy)

Alessandro Mingotti (University of Bologna, Italy)

Lorenzo Peretto (University of Bologna, Italy)

Roberto Tinarelli (University of Bologna, Italy)

12:00

Detection of Anomalies in Power Profiles using Data Analytics

Grigore Stamatescu (University Politehnica of Bucharest, Romania)

Irina Ciornei (University of Cyprus, Cyprus)

Radu Plamanescu (University Politehnica of Bucharest, Romania)

Mihaela Albu (Politehnica University of Bucharest, Romania)

12:30

Bad Data Detection and Handling in ICT Platforms for Energy Systems

Daniele Carta (Forschungszentrum Jülich, Germany)

Marcel Zimmer (Forschungszentrum Jülich, Germany)

Thiemo Pesch (Forschungszentrum Jülich, Germany)

Andrea Benigni (Forschungszentrum Jülich, Germany)

13:00 – 14:30

Lunch

14:30 – 16:00

Power Quality Measurements

Session Chair: Mario Luiso (University of Campania Luigi Vanvitelli, Italy)

Room: Stampace

14:30

Analysis of waveform distortion during a voltage dip: a preliminary study

Julio Barros (University of Cantabria, Spain)

Matilde Apraiz (University of Cantabria, Spain)

Ramón I. Diego (University of Cantabria, Spain)

15:00

Effect of Sampling Rate and Sensor Bandwidth on Measured Transient Signals in LV AC and DC Power Systems

Yljon Seferi (University of Strathclyde, United Kingdom (Great Britain))

Arshad Arshad (University of Strathclyde, United Kingdom (Great Britain))

Mazheruddin H. Syed (University of Strathclyde, United Kingdom (Great Britain))

Graeme Burt (University of Strathclyde, United Kingdom (Great Britain))

Brian G Stewart (University of Strathclyde, United Kingdom (Great Britain))

15:30

Potential usages of EDA techniques for PQ analysis in modern instrumentation systems

Paula Remigio-Carmona (University of Cadiz, Spain)

Juan José González de la Rosa (University of Cadiz, Spain)

Olivia Florencias-Oliveros (University of Cadiz, Spain)

Jose Maria Sierra-Fernández (University of Cadiz & PAIDI-TIC-168 Reserach Group, Spain)

Manuel Jesús Espinosa-Gavira, MJEG (University of Cadiz & PAIDI-TIC-168 Reserach Group, Spain)

Javier Fernández-Morales (University of Cadiz, Spain)

Agustin Agüera-Pérez (University of Cadiz, Spain)

Jose Carlos Palomares-Salas (University of Cadiz & Research Unit PAIDI-TIC-168, Spain)

16:00 – 16:30

Break

16:30 – 17:30

Line Parameters Estimation

Session Chair: Johan Rens (North West University, South Africa)

Room: Stampace

16:30

Application of Different Least Square Methods for Transmission Line Parameter estimation

Sasa Vlahinic (University of Rijeka, Croatia)

Dubravko Franković (University of Rijeka, Croatia)

Marijana Zivic Djurovic (University of Rijeka, Croatia)

17:00

Impact of Current Transformers on Line Parameters Estimation based on Synchronized Measurements

Carlo Sitzia (University of Cagliari, Italy)

Paolo Attilio Pegoraro (University of Cagliari, Italy)

Sara Sulis and Antonio Vincenzo Solinas (University of Cagliari, Italy)

Christian Laurano (Politecnico di Milano, Italy)

Sergio Toscani (Politecnico di Milano, Italy)

Friday, September 30

09:00 – 11:00

Power System Harmonics and Supraharmonics

Session Chair: Juan José González de la Rosa (University of Cadiz, Spain)

Room: Stampace

09:00

Comparison of laboratory and grid measurements of 9 kHz to 150 kHz appliance emissions

Stefano Lodetti (National Physical Laboratory, United Kingdom (Great Britain))

Peter Davis (National Physical Laboratory, United Kingdom (Great Britain))

Deborah Ritzmann (University of Reading & National Physical Laboratory, United Kingdom (Great Britain))

Paul Wright (National Physical Laboratory, United Kingdom (Great Britain))

Victor Khokhlov (Technische Universität Dresden, Germany)

Jan Meyer (Technische Universität Dresden, Germany)

Daniela P. Istrate (29, Av. Roger Hennequin & LNE, France)

Kahina Kasri (LNE, France)

Helko van den Brom (VSL, The Netherlands)

Gu Ye (VSL, The Netherlands)

Ronald van Leeuwen (VSL, The Netherlands)

Alexander Gallarreta (University of the Basque Country, Spain)

David de la Vega (University of the Basque Country (UPV/EHU), Spain)

09:30

Tracking harmonic filter performance using aggregated harmonic phasors

Johan Rens (North West University, South Africa)

Jan Meyer (Technische Universität Dresden, Germany)

Brandon Peterson (North-West University & Eskom, South Africa)

10:00

Novel Two-Point Interpolation DFT Method for Frequency Estimation of Sine-Wave Within a Short Time Window

Jian Song (Hunan University & College of Electrical and Information Engineering, China)

Junhao Zhang (Hunan University, China)

Alessandro Mingotti (University of Bologna, Italy)

Lorenzo Peretto (University of Bologna, Italy)

He Wen (Hunan University & College of Electrical and Information Engineering, China)

10:30

Adaptation of the IEC 61000-4-7 Measurement Method to CISPR Band A (9-150 kHz)

Alexander Gallarreta (University of the Basque Country, Spain)

Igor Fernandez Perez (University of the Basque Country (UPV/EHU), Spain)

Deborah Ritzmann (University of Reading & National Physical Laboratory, United Kingdom (Great Britain))

Stefano Lodetti (National Physical Laboratory, United Kingdom (Great Britain))

Victor Khokhlov (Technische Universität Dresden, Germany)

Paul Wright (National Physical Laboratory, United Kingdom (Great Britain))

Jan Meyer (Technische Universität Dresden, Germany)

David de la Vega (University of the Basque Country (UPV/EHU), Spain)

11:00 – 11:30

Break

11:30 – 13:00

Measurements on Power System Components

Session Chair: Carlo Muscas (University of Cagliari, Italy)

Room: Stampace

11:30

Comparative Analysis and Validation of Basic Battery Models for Electric Vehicles Applications

Aanandsundar Arumugam (University of Campania Luigi Vanvitelli, Italy)

Giuliano Cipolletta (University of Campania Luigi Vanvitelli, Italy)

Antonio Delle Femine (University of Campania Luigi Vanvitelli, Italy)

Daniele Gallo (University of Campania Luigi Vanvitelli, Italy)

Carmine Landi (University of Campania Luigi Vanvitelli, Italy)

Mario Luiso (University of Campania Luigi Vanvitelli, Italy)

12:00

A Simple Approach to Quantify Accuracy of Power Systems Inertia

Federica Costa (University of Bologna, Italy)

Alessandro Mingotti (University of Bologna, Italy)

Lorenzo Peretto (University of Bologna, Italy)

Roberto Tinarelli (University of Bologna, Italy)

12:30

Time domain symmetry parameters analysis for series arc fault detection

Giovanni Artale (Università di Palermo, Italy)

Antonio Cataliotti (Università degli Studi di Palermo, Italy)

Valentina Cosentino (University of Palermo, Italy)

Dario Di Cara (National Research Council, Italy)

Antonio Di Stefano (Prysmian Electronics, Italy)

Nicola Panzavecchia (National Research Council, Italy)

Giovanni Tinè (CNR-INM, Italy & PALERMO UNIT, Italy)

Aurelio Zinno (Electronic Engineering, Italy)