



2021 11TH IEEE International Workshop on
**Applied Measurements
for Power Systems**

September 29 - October 1, 2021 | Virtual Workshop



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Welcome Message from the Chairmen

AMPS 2021, sponsored by the IEEE Instrumentation and Measurement Society and organized by the TC39 "Measurements in Power Systems", is the 11th edition of the IEEE International workshop on Applied Measurements for Power Systems.

This year, after missing the 2020 edition due to well-known restrictions caused by COVID pandemic, AMPS workshop is held as virtual event. This different modality has not affected the number and quality of submitted papers, compared to previous editions, thus confirming the high and fresh motivations, for both academia and industry, toward measurements in modern electric power systems.

The promotion of a fruitful interaction between all the relevant stakeholders continues to be indeed the primary goal of the workshop, with the aim of exchanging knowledge, informing about new research activities and facilitating the impact of research outcomes on present and future technology.

The papers presented in these proceedings have been divided into ten homogeneous technical sessions: two sessions are dedicated to Phasor Measurement Units and their applications; two sessions deal with voltage and current sensors along with relevant characterization techniques; two sessions consider power quality measurements, with an additional one specifically dedicated to power system harmonics; one session concerns measurements on power system components; one session is dedicated to grid monitoring and one to measurements for Smart Grid.

We hope this virtual workshop will be a bridge toward future face-to-face editions, so that AMPS continues to represent a qualified forum for discussing the most recent advancement of the knowledge on these topics.

Welcome to AMPS 2021!

General Co-Chairs

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

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

IEEE AMPS 2021 Organizers

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Carlo Muscas, *University of Cagliari, Italy*

Lorenzo Peretto, *University of Bologna, Italy*

Technical Program Chair:

Antonello Monti, *E. ON Energy Research Center RWTH Aachen University, Germany*

Steering Committee:

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Ferdinanda Ponci, *E. ON Energy Research Center RWTH Aachen University, Germany*

Mario Luiso, *University of Campania "Luigi Vanvitelli", Italy*

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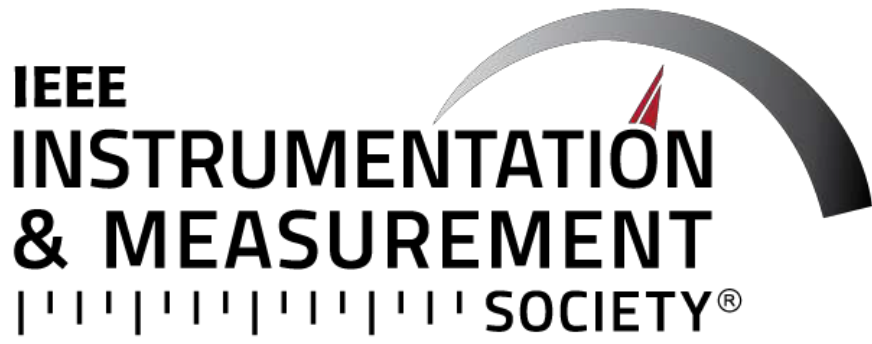
Paolo Attilio Pegoraro, *University of Cagliari, Italy*

Roberto Ferrero, *University of Liverpool, UK*

Roberto Tinarelli, *University of Bologna, Italy*

Conference Management:

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Wednesday, September 29

09:00 - 09:30

Welcome Address

09:30 - 11:00

Phasor Measurement Units I

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

09:30

Review of PMU Algorithms Suitable for Real-Time Operation With Digital Sampled Value Data

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

Renan Quijano Cetina (Universidad Autonoma de Yucatan, Mexico)

Steven Blair (Synaptec Ltd, United Kingdom (Great Britain))

10:00

Phasor Measurement Unit and Sampled Values: Measurement and Implementation Challenges

Guglielmo Frigo (Federal Institute of Metrology METAS, Switzerland)

Marco Agustoni (METAS, Switzerland)

10:30

Using Mains Frequency Synchronously Sampled Data for Frequency and RoCoF Event Detection

Jan-Philipp Kitzig (Hochschule Ruhr West, Germany)

Gerd Bumiller (Hochschule Ruhr West & University of Applied Sciences, Germany)

11:00 – 11:30

Break

11:30 – 13:00

Power system monitoring

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

11:30

An Augmented Branch Current Formulation for State Estimation in Distribution Systems Marco Pau and Ferdinanda Ponci (RWTH Aachen University, Germany)

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

Paolo Attilio Pegoraro (University of Cagliari, Italy)

Sara Sulis (University of Cagliari, Italy)

Carlo Muscas (University of Cagliari, Italy)

12:00

Performance Evaluation of a Missing Data Recovery Approach Based on Compressive Sensing

Daniele Carta (Forschungszentrum Jülich, Germany)

Andrea Benigni (Forschungszentrum Jülich, Germany)

12:30

A PMU-based Technique for the Simultaneous Estimation of Systematic Measurement Errors, Line Parameters and Tap Changer Ratio

Paolo Attilio Pegoraro (University of Cagliari, Italy)

Carlo Sitzia (University of Cagliari, Italy)

Antonio Vincenzo Solinas (University of Cagliari, Italy)

Sara Sulis (University of Cagliari, Italy)

13:00 – 14:00

Break

14:00 – 15:30

Measurements for smart grids

Session Chair: Paolo Castello (University of Cagliari, Italy)

14:00

Reporting Interval Impact on Deep Residential Energy Measurement Prediction

Grigore Stamatescu (University Politehnica of Bucharest, Romania)

Irina Ciornei (University of Cyprus, Cyprus)

Radu Plamanescu (University Politehnica of Bucharest, Romania)

Ana Maria Dumitrescu (Politehnica University of Bucharest, Romania)

Mihaela Albu (Politehnica University of Bucharest, Romania)

14:30

Impact of the Measurement Time Resolution on Energy Key Performance Indicators for Distributed Energy Resources: An Experimental Analysis

Marco Pasetti (University of Brescia, Italy)
Stefano Rinaldi (University of Brescia, Italy)
Paolo Bellagente (University of Brescia, Italy)
Alessandro Depari (University of Brescia, Italy)
Paolo Ferrari (University of Brescia, Italy)
Alessandra Flammini (University of Brescia, Italy)
Emiliano Sisinni (University of Brescia, Italy)

15:00

Towards the virtualization of measurements: architecture, solutions and challenges

Carlo Guarnieri Calò Carducci (RWTH Aachen University, Germany);
Marco Pau (RWTH Aachen University, Germany)
Ferdinanda Ponci (RWTH Aachen University, Germany)
Antonello Monti (RWTH Aachen University & Institute for Automation of Complex Power Systems, Germany)

15:30 – 16:00

Break

16:00 – 17:30

Voltage and current sensors I

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

16:00

External Magnetic Fields Effect on Harmonics Measurements with Rogowski coils

Alessandro Mingotti (University of Bologna, Italy)
Federica Costa (University of Bologna, Italy)
Lorenzo Peretto (University of Bologna, Italy)
Roberto Tinarelli (University of Bologna, Italy)

16:30

Novel Calibration systems for the dynamic and steady-state testing of digital instrument transformers

Yeying Chen (National Metrology Institute of Germany (PTB), Germany)
Gabriella Crotti (Istituto Nazionale di Ricerca Metrologia, Italy)
Alexander Dubowik (Physikalisch-Technische Bundesanstalt (PTB), Germany)
Palma Sara Letizia (INRiM-Istituto Nazionale di Ricerca Metrologica & Politecnico di Torino, Italy)
Enrico Mohns (Scientist, Germany)
Mario Luiso (University of Campania Luigi Vanvitelli, Italy)
Jorge Bruna (CIRCE, Spain)

17:00

Non-invasive Magnetic Sensors for Measurement of Current Phasors in Power Systems: Calibration and Validation

Prasad Shrawane (University of Ontario Institute of Technology, Canada)
Tarlochan Sidhu (Ontario Tech University, Canada)

Thursday, September 30

09:30 – 11:00

Phasor Measurement Units II

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

09:30

Compressive Sensing Taylor-Fourier and Windowing Approach for Synchronized Phasor, Frequency and ROCOF Measurements

Guglielmo Frigo (Federal Institute of Metrology METAS, Switzerland)

Paolo Attilio Pegoraro (University of Cagliari, Italy)

Sergio Toscani (Politecnico di Milano, Italy)

10:00

Kalman Filtering with Harmonics Whitening for P Class Phasor Measurement Units

Amir Bashian (University of Trento, Italy)

David Macii (University of Trento, Italy)

Daniele Fontanelli (University of Trento, Italy)

Dario Petri (University of Trento, Italy)

10:30

Integration of power quality and fault data into a PMU-based Wide Area Monitoring System

Paolo Castello (University of Cagliari, Italy)

Carlo Muscas (University of Cagliari, Italy)

Paolo Attilio Pegoraro (University of Cagliari, Italy)

Sara Sulis (University of Cagliari, Italy)

Giorgio Giannuzzi (Terna, Italy)

Martina Pede (Terna, Italy)

Camilla Maiolini (Terna, Italy)

Pietro Pau (Terna, Italy)

Fabio Bassi (Terna, Italy)

Claudio Coluzzi (Terna Rete Italia, Italy)

11:00 – 11:30

Break

11:30 – 13:00

Power system harmonics

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

11:30

Real-Time Harmonic Component Decomposition for LV Grids Using Heterodyne Method With Adaptive Moving Average Filters

Tawichai Premgamone (South Westphalia University of Applied Sciences, Germany)

Jan Kortenbruck (South Westphalia University of Applied Sciences, Germany)

Egon Ortjohann (South Westphalia University of Applied Sciences, Germany)

Andreas Schmelter (South Westphalia University of Applied Sciences, Germany)

Daniel Holtschulte (South Westphalia University of Applied Sciences, Germany)

Shashank Varada (South Westphalia University of Applied Sciences, Germany)

12:00

Comparison of two different approaches for harmonic distortion sources assessment

Giuseppe Caravello (University of Palermo, Italy)

Antonio Cataliotti (Università degli Studi di Palermo, Italy)

Dario Di Cara (National Research Council, Italy)

Giovanni Artale (Università di Palermo, Italy)

Valentina Cosentino (University of Palermo, Italy)

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

Vito Ditta (Università degli Studi di Palermo, Italy)

Aljaz Spelko (University of Ljubljana, Slovenia)

Bostjan Blazic (University of Ljubljana, Slovenia)

12:30

Simplified method for measurement-based black-box harmonic stability assessment of single-phase power electronic devices

Elias Kaufhold (Technische Universität Dresden, Germany)

Jan Meyer (Technische Universität Dresden, Germany)

Carlos Duque (UFJF, Brazil)

Peter Schegner (TU Dresden, Germany)

13:00 – 14:00

Break

14:00 – 15:30

Power quality measurements I

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

14:00

An IEC 61850 Sampled Values-based Analyzer for Power Quality applications on Smart Substations

Miguel Ángel Oliván (CIRCE, Spain)

Alfonso Mareca (CIRCE, Spain)

Jorge Bruna (CIRCE, Spain)

David Cervero (CIRCE, Spain)

14:30

Power Quality in DC railway systems

Domenico Giordano (Istituto Nazionale di Ricerca Metrologica, Italy)

Davide Signorino (Istituto Nazionale di Ricerca Metrologica (INRIM), Italy)

Daniele Gallo (University of Campania Luigi Vanvitelli, Italy)

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

Giuliano Cipolletta (University of Campania Luigi Vanvitelli, Italy)

15:00

Optimized Matrix Pencil-based Algorithm for Modulation Parameter Estimation of Voltage Flicker Signal

Jingbo Zhao (Hunan University, China)

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

Junhao Zhang (Hunan University, China)

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

15:30 – 16:00

Break

16:00 – 17:30

Measurements on power system components

Session Chair: Marco Pau (RWTH Aachen University, Germany)

16:00

Fast measurement-based identification of small signal behaviour of commercial single-phase inverters

Elias Kaufhold (Technische Universität Dresden, Germany)

Jan Meyer (Technische Universität Dresden, Germany)

Peter Schegner (TU Dresden, Germany)

16:30

Variability of EMI Measurement for Switched Mode Power Supplies EMI in the 2-1000 kHz Range

Andrea Mariscotti (University of Genova, Italy)

Leonardo Sandrolini (University of Bologna, Italy)

17:00

A Novel Non-invasive Harmonic Resonance Detection in Public LV networks

Shrinath Kannan (Technische Universität Dresden, Germany)

Jan Meyer (Technische Universität Dresden, Germany)

Johan Rens (North West University, South Africa)

Peter Schegner (TU Dresden, Germany)

Friday, October 1

09:00 – 11:00

Voltage and current sensors II

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

09:00

Compensating the Harmonic Distortion Introduced by Instrument Transformers: An Improved Method Based on Frequency-Domain Polynomials

Marco Faifer (Politecnico di Milano, Italy)

Christian Laurano (RSE - Ricerca sul Sistema Energetico, Italy)

Roberto Ottoboni (Politecnico di Milano, Italy)

Sergio Toscani (Politecnico di Milano, Italy)

09:30

Traceable calibration system for non-conventional current sensors with analogue or digital output

Yeying Chen (National Metrology Institute of Germany (PTB), Germany)

Enrico Mohns (Scientist, Germany)

Michael Seckelmann (Physikalisch Technische Bundesanstalt, Germany)

Soeren de Rose (Physikalisch-Technische Bundesanstalt (PTB), Germany)

10:00

Contactless HVDC Overhead-Line Current Measurement With a Self-Contained Calibration Function

Kun-Long Chen (National Taiwan University of Science and Technology, Taiwan)

Yukai Xiang (State Grid Longyan Electric Power Supply Company, China)

10:30

Instrument Transformers for Power Quality Measurements: a Review of Literature and Standards

Gabriella Crotti (Istituto Nazionale di Ricerca Metrologia, Italy)

Giovanni D'Avanzo (University of Campania Luigi Vanvitelli, Italy)

Carmine Landi (University of Campania Luigi Vanvitelli, Italy)

Palma Sara Letizia (INRiM-Istituto Nazionale di Ricerca Metrologica & Politecnico di Torino, Italy)

Mario Luiso (University of Campania Luigi Vanvitelli, Italy)

Fabio Munoz (VSL, Dutch National Metrology Institute, The Netherlands)

Helko van den Brom (VSL, The Netherlands)

11:00 – 11:30

Break

11:30 – 13:00

Power quality measurements II

Session Chair: Sara Sulis (University of Cagliari, Italy)

11:30

Instrument for Power Quality monitoring using Higher-Order Statistics 2D planes

Olivia Florencias-Oliveros (University of Cadiz, Spain)

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

12:00

Power System Low Frequency Oscillations Analysis Based on Adaptive ESPRIT method

Lepeng Wen (Hunan University, China)

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

Junhao Zhang (Hunan University, China)

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

12:30

Taylor-Fourier Multifrequency Model for Supra-Harmonic Identification and Estimation

Guglielmo Frigo (Federal Institute of Metrology METAS, Switzerland)