

2025 IEEE International Workshop on Metrology for Sustainability (MetroSustainability 2025)

**Benevento, Italy
4-5 December 2025**

IEEE Catalog Number:
ISBN:

CFP252AO-POD
979-8-3315-8567-9



Copyright © 2025, IEEE

All Rights Reserved

Copyright and Reprint Permissions:

Abstracting is permitted with credit to the source. Libraries are permitted to photocopy beyond the limit of U.S. copyright law for private use of patrons those articles in this volume that carry a code at the bottom of the first page, provided the per-copy fee indicated in the code is paid through Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923.

For other copying, reprint or republication permission, write to IEEE Copyrights Manager, IEEE Service Center, 445 Hoes Lane, Piscataway, NJ 08854. All rights reserved.

*** This is a print representation of what appears in the IEEE Digital Library. Some format issues inherent in the e-media version may also appear in this print version.

IEEE Catalog Number:	CFP252AO-POD
ISBN (Print-On-Demand):	979-8-3315-8567-9
ISBN (Online):	979-8-3315-8566-2

Additional Copies of This Publication Are Available From:

Curran Associates, Inc
57 Morehouse Lane
Red Hook, NY 12571 USA

Phone:	(845) 758-0400
Fax:	(845) 758-2633
E-mail:	curran@proceedings.com
Web:	www.proceedings.com

TABLE OF CONTENTS

Innovative Strategy for Electrical Calibration Management – Laboratory Sustainability for Metrology 5.0	1
<i>Marija Cundeva-Blajer</i>	
A Flexible Thermoelectric Power Source for Sustainable and Conformable Applications	7
<i>Carlo Trigona, Giuliano A. Salerno, Andrea D’Amico, Salvatore Baglio, Samuel Margueron</i>	
Sustainability of Telemedicine: A Comparative Analysis with In-Person Visitation	12
<i>Leopoldo Angrisani, Mauro D’Arco, Egidio De Benedetto, Luigi Duraccio, Immacolata Esposito Annarita Tedesco</i>	
Intelligent Indoor Air Quality System with Web-Application Based Monitoring and Real-Time Response to Household Pollutants Through a Dynamic Control System	17
<i>Jack Hick, Sean Hogan, Soumyajyoti Maji</i>	
Machine Learning for Air Quality Monitoring with Low-Cost Sensors: Evaluating Calibration Approaches Through Relative Expanded Uncertainty	23
<i>Evangelos Bagkis, Theodosios Kassandros, Kostas Karatzas</i>	
A Life Cycle Assessment of photovoltaic integration in future South Tyrol’s energy scenarios	28
<i>Elisa Veronese, Cristina Polacchi, Davide Prando, Anna Carassai, Alessandro Donadello, Grazia Barchi</i>	
Probabilistic Models for Photovoltaic Production Forecasting: A Case Study at the Politecnico di Torino Campus	34
<i>Antonio Costantino Marceddu, Jacopo Sini, Alessandro Ciocia, Gianluca Cardinale, Filippo Spertino Gianfranco Chicco, Bartolomeo Montrucchio</i>	
Star-Shaped SOI-AlN MEMS Thermoelectric Generators for Enhanced Thermal Gradient Conversion	40
<i>C. Trigona, S.A. Almani, A. Mio, G. Costanzo, A. Riolo, S. Baglio</i>	
A Hybrid 6-DoF Pose Measurement System Using String Potentiometer and Dual IMUs	45
<i>Zhendai Huang, Zuyan Chen, Ameer Tamoor Khan, Yu Gan, Fei Hu, Juha Rönning, Shuai Li</i>	
Measuring the Environmental Impact of ICT Products and Systems: An initial overview	51
<i>Leopoldo Angrisani, Mauro D’Arco, Egidio De Benedetto, Luigi Duraccio, Immacolata Esposito Annarita Tedesco</i>	
Robotics in Sustainability: Opportunities and Challenges for a Holistic Environmental Assessment	57
<i>Leopoldo Angrisani, Zuyan Chen, Egidio De Benedetto, Luigi Duraccio, Immacolata Esposito Zhendai Huang, Shuai Li, Fabrizio Lo Regio, Annarita Tedesco</i>	
Life Cycle Assessment of Polyphenolic Extracts from Agro-Industrial By-Products	63
<i>Giuseppina Forgione, Daniela Sateriale, Libera Esposito, Marina Paolucci, Andrea D’Anna Paola Salvatore, Caterina Pagliarulo</i>	
Sustainable Green Light LiDAR Metrology:Novel Measurement Techniques Maritime Environmental Monitoring and Port Security	68
<i>Satyajit Lingras, Aruni Basu, Husain Ansari</i>	

Pietra Leccese stone as a building material: radiometric and radiation protection characterization of a calcarenite for new insights	74
<i>Micaela Prisco, Gaetano Gagliardo, Mariagabriella Pugliese, Andrea D'Elia, Fabrizio Ambrosino Chiara Imperato, Giuseppe La Verde</i>	
Modified Gellan Gum Gels with Nanodiamonds, tert-butylammonium borane and calcium propionate for the Cleaning Cultural Heritage Artifacts	80
<i>Elena Palmieri, Silvia Cristofani, Claudia Mazzuca, Noemi Orazi, Silvia Orlanducci</i>	
An Electrodermal Activity-Based Approach for the Assessment of Cognitive Stress	86
<i>Vittorio Santoriello, Alfonso Maria Ponsiglione, Leandro Donisi, Valeria Proietti Dante, Marco Bazzani Marco Cascella, Maria Romano, Francesco Amato</i>	
Performance Analysis of Thermoelectric Generators Coupled with Pietra di Modica for Thermal Gradient Enhancement	92
<i>Carlo Trigona, Mohamd Amine Karoui, Giuseppe Politi, Anna Maria Gueli, Cristina Maria Belfiore</i>	
Development of Analytical Models for the Electromagnetic Field Analysis of a Three-phase DD-PMSGs for Wind Turbine Applications	98
<i>Marjan Noroozi, Reza Yazdanpanah, Abbas Mehrad Kazemi Amiri, Ziad Azar, Alasdair McDonald</i>	
A Smart Hydroponic System for Sustainable and Health-Centric Agriculture	104
<i>Víctor José Huilca, Alexandra Macarena Flores, Juan Pablo Haro, Miguel Angel Osorio Omar Darío Delgado</i>	
A Metrological Framework for Sustainable Cyber-Physical Systems	110
<i>Maurizio Giacobbe, Salvatore Distefano</i>	
Integrated energy-based assessment of settlement-induced crack patterns of Pietà dei Turchini church in Naples	115
<i>Andrea Montanino, Antonino Iannuzzo</i>	
Assessing Seismic Vulnerability in Historic Masonry Aggregates: Limitations of Unit-Based Strengthening Approaches	121
<i>Generoso Vaiano, Francesco Fabbrocino</i>	
Green metrology for power integrity: PSRR characterization via compressed sensing	127
<i>Ioan Tudosa, Francesco Picariello, Eulalia Balestrieri</i>	
Synthetic Twins: Toward Sustainable, Tunable 3D Printed Models of Human Tissues	133
<i>Gianmarco Dolino, Damiano Coato, Alice Berardo, Emanuele Luigi Carniel, Paolo Gargiulo</i>	
Generalizable and Sustainable Feature Selection for Medical Imaging: A Case Study in Knee Osteoarthritis	138
<i>Ida Maruotto, Federica Kiyomi Ciliberti, Marco Recenti, Halldór Jónsson, Paolo Gargiulo</i>	
A Transfer Learning Approach for Detecting Buds of Posterior Teeth	144
<i>Francesca Angelone, Parisa Soltani, Homa Baninajarian, Shakiba Sadeghizadeh, Amirhossein Vedae Alessia La Rocca, Armando Ricciardi, Mario Sansone, Maria Romano, Francesco Amato Alfonso Maria Ponsiglione</i>	
Electromyographic Signatures of Postural Control: Insights into Gender Differences	150
<i>Vittorio Santoriello, Ida Maruotto, Lorena Guerrini, Federica Pescaglia, Carmine Gelormini Giuseppe Cesarelli, Carlo Ricciardi, Alfonso Maria Ponsiglione, Paolo Gargiulo</i>	

Acoustic Emission Monitoring for Structural Health Assessment: The Case of the Geiger Key Bridge	155
<i>Luciana Di Gennaro, Giorgio Frunzio, Michela Monaco, Giovanni Loreto</i>	
A Low-Cost Vision-based monitoring system for dynamic testing of a cantilever beam	161
<i>Francesco Picariello, Michela Monaco, Arman Neyestani</i>	
Structural damage identification through PCA and subspace comparison	167
<i>Gianna Agrò, Elio Lo Giudice, Giuseppe Mugnos</i>	
Automatic Mapping Of Vegetated Areas In Benevento (Italy) From Sentinel-2 Images	172
<i>Francesca Guastaferrò, Claudio Parente, Andrea Vallario, Vincenzo Verde</i>	
Coastline Automatic Extraction From Sentinel-2 Images: Different Methodological Approaches In Comparison	178
<i>Giuseppina Costanzo, Gianluigi Ferrara, Claudio Parente, Vincenzo Verde</i>	
Using GIS Tools For Mapping Sea Level Rise Impacts On Casal Velino Coast (Italy)	184
<i>Ugo Falchi, Pasquale Maglione, Paola Mercogliano, Claudio Parente</i>	
Commissioning of RadCalc Monte-Carlo IDC model for clinical plan verification and EPID-based in vivo dosimetry	190
<i>Rocco Mottareale, Valentina d'Alesio, Francesca Buonanno, Marcello Serra, Gianluca Ametrano, Cecilia Arrichiello, Gaetano Gagliardo, Vincenzo Ravo</i>	
External Dosimetry Audit IAEA/WHO for Validation of Megavoltage X-ray Beams	196
<i>Rocco Mottareale, Cecilia Arrichiello, Marcello Serra, Gianluca Ametrano, Francesca Buonanno, Valentina d'Alesio, Gaetano Gagliardo, Vincenzo Ravo</i>	
GammaPodTM: A Novel Approach to Stereotactic Breast Cancer Radiotherapy	201
<i>Gaetano Gagliardo, Marcello Serra, Valentina d'Alesio, Gianluca Ametrano, Francesca Buonanno, Cecilia Arrichiello, Rocco Mottareale, Sara Falivene, Piera Ferraioli, Vincenzo Ravo</i>	
LINACWatch®: An advanced patient and machine quality assurance system based on logfile	207
<i>Gaetano Gagliardo, Caterina Muto, Ferdinando Francomacaro, Ivona Zlatkova, Vincenzo Iorio, Marcello Serra</i>	
Phantom-Based Image Quality Assessment of the ImagingRing Scanner for Image-Guided ¹⁹² Ir High-Dose-Rate Brachytherapy planning	212
<i>Francesca Buonanno, Rocco Mottareale, Valentina d'Alesio, Cecilia Arrichiello, Gianluca Ametrano, Marcello Serra, Gaetano Gagliardo, Federica Gherardi, Eva Iannaccone, Mario Petrazzuoli, Vincenzo Ravo</i>	
SERS Detection of Cypermethrin Using Gold-Coated MgFe Hydrotalcite Nanostructures on Sustainable Cellulose Substrate	218
<i>Rocco Carcione, Elena Palmieri, Luca Montaina, Ivano Lucarini, Tamara Posati, Francesco Maita, Alessia Cemmi, Luca Maiolo</i>	
Gamma Irradiation Effect on Ethyl Cellulose Foils: Advancing Sterilizable and Sustainable Biopolymer Materials	224
<i>Elena Palmieri, Rocco Carcione, Luca Maiolo, Beatrice D'Orsi, Alessia Cemmi, Francesco Maita</i>	
Cellulose nanocrystals as sustainable consolidant for fragile paper artworks: synthesis, characterization and application	230
<i>Laura Spagnuolo, Leonardo Severini, Claudia Mazzuca, Federica Tuzzolo, Laura Micheli, Alessandra Terrei, Angelo Restaino, Simone Luciani, Angelo Traina, Alessandra Operamolla</i>	

Eco-Friendly Restoration of Parchment Using Nanodiamond-Enhanced Materials	236
<i>Elena Palmieri, Cristina Cicero, Noemi Orazi, Claudia Mazzuca, Fulvio Mercuri, Ugo Zammit Beatrice Ercolani, Silvia Orlanducci</i>	
Development of Polyaniline-Based Polysaccharide Composite for Biomedical Applications	242
<i>Francesca Pescosolido, Luca Montaina, Rocco Carcione, Felicia Carotenuto, Paolo Di Nardo Silvia Battistoni, Emanuela Tamburri</i>	
Experimental Study and Affordable Instrumentation of a Piezo-Thermoelectric Hybrid Road Energy Harvester: Field Implementation	248
<i>Ando Ny Aina Randriantsoa, Marcel Ramarolahy, Tsiry Fifaliana Rakotoniaina, Vonjy Ramarozatovo Rijalalaina Rakotosaona, Luc Rakotondrajaona, Damien Ali Hamada Fakra</i>	
Signal Time-Advance Measurement with LP-NGD Circuit	254
<i>Idiris Aweis Hussein, Nathan B. Gurgel, Willys Noa, Ali Hamada Damien Fakra, Sébastien Lalléchère Blaise Ravelo</i>	
Data-Driven Diagnosis of Building-Envelope Thermal Behavior in Real Time	260
<i>Lahoucine Ouhsaine, Damien Ali Hamada Fakra, Mohammed El Ganaoui</i>	
Air Quality Prediction in Indoor Environments: A Review of Methods and Limitations	266
<i>Lecras Arthur, Roozbeh Sadeghian Broujeny, Abhinandana Boodi, Jacques Courbier, Karim Beddiar</i>	
Influence of CO ₂ Sampling Techniques on ¹⁴ C-Based Biogenic Carbon Quantification in Waste-to-Energy Emission	272
<i>Luigi Sabino, Mauro Rubino, Carolina Allocca, Anna Di Palma, Beatrice Papa, Lorenzo Rambaldo Fabio Marzaioli</i>	
Sustainability Decommissioning of Radioactive Wastewater from Nuclear Power Plants by Means of Zeolite Materials	277
<i>Fabrizio Ambrosino</i>	
Activity concentration measurements of radon gas in indoor environment of Benevento city, Campania region - South Italy	282
<i>Chiara De Vita, Mariagabriella Pugliese, Giuseppe La Verde, Chiara Imperato, Fulvio Coppola Misbah Javed, Carlo Sabbarese, Fabrizio Ambrosino</i>	
Reusing Phosphate Fertilizer By-products in Construction: Balancing Circular Economy Benefits with Radiological Safety	287
<i>Chiara Imperato, Marina Poje Sovilj, Giuseppe La Verde, Chiara de Vita, Misbah Javed Fabrizio Ambrosino, Carlo Sabbarese, Mariagabriella Pugliese</i>	
Radon exposure monitoring and dose assessment for workers in drinking water distribution and sewerage plants in Naples, South Italy	292
<i>Fulvio Coppola, Domenico Accardo, Fabrizio Ambrosino, Vincenzo D'Onofrio, Sergio De Marco Giuseppe La Verde, Mariagabriella Pugliese</i>	
Quality assurance of radon activity concentrations measurement in wells and water supply systems of Osijek-Baranja County, Croatia	297
<i>Marina Poje Sovilj, Mirjam Pavošević, Vanja Radolić</i>	
CloudChain: Decentralized Marketplace for AI Compute Resources	303
<i>Monika Malik</i>	

Unlocking the Potential of Cloud Computing for Sustainable Energy and Cost-Efficient Artificial Intelligence Workloads	309
<i>Chaitanya Kumar Mankala</i>	
A novel heterogeneous limit analysis framework for the collapse assessment of curved masonry constructions under different loading scenarios	315
<i>Mohammad Pourfouladi, Natalia Pingaro, Gabriele Milani</i>	
Sustainability and Equity Challenges of Nuclear Fission and Fusion	321
<i>Vittorio Ciardiello, Daniele Davino, Vincenzo Paolo Loschiavo, Carlo Silano</i>	