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Special Issue on Measurements, Sensors and Standards in Modern Communication Networks

In the last years, communication networks have become a central piece for many applications in multiple domains, including commercial and industrial systems, personal care and medicine, modern vehicles and vehicular networks, and environmental and disaster early-warning monitoring, to cite a few examples. Each application field has specific constraints regarding data rate, connectivity, security, immunity to electromagnetic disturbances, coverage area, and power consumption. Therefore, designers and researchers are continuously engaged in new challenges for reaching the expected targets in terms of performance and actual applicability in the field while considering the costs and requirements in designing suitable architectures warranting scalability, the required level of security and effective maintainability, and resilience.

Consequently, network metrology and measurements play a fundamental role in addressing these challenges to meet the specific constraints and expected performance of network applications. The standardization in these application areas is also crucial because it assures standard and reliable measurement procedures for characterization and benchmarking of systems and devices, as well as the interoperability among devices offered by different vendors.

In this context, six papers have been accepted for publication after a careful review process. The accepted papers address several aspects of the fields mentioned above by covering different network layers and frequency ranges. The variety of selected papers reflects the efforts made by all authors to focus on methodological aspects and technical issues in several fields of Measurements and Networking.

In more detail, in one of the articles, the problem of positioning in complex environments is faced by analyzing the leading causes of uncertainty and proposing suitable measurement procedures and processing techniques to improve the positioning accuracy.

In another article, the critical issue of the time synchronization for modern smart grid implementation is analyzed by describing the methods allowable by the technical standard in force (IEC Standard 61850-5:2013) and by showing some straightforward procedures able to reduce synchrophasor phase estimation uncertainty.

A third article proves how the Asia-Europe link could be effectively adopted for implementing the Two-way satellite time and frequency transfer (TWSTFT) in calculating coordinated universal time (UTC). Indeed, the Bureau International des Poids et Mesures (BIPM) adopts this technique. The accuracy reached demonstrates how the Asia-Europe TWSTFT link could be used for UTC time transfer after a suitable procedure calibration based on GPS PPP.

In the fourth article, Artificial Intelligence (AI) techniques are tested in real scenarios for evaluating the performance of a network delay predictor, which assists a measurement system through the use of machine learning (ML). The achieved accuracy is very attractive since it is above 90%, thanks to the adoption of the ML with software engineering's well-known concept of Development Operations and the employment of transfer learning.

Another article describes the important role of measurements in developing a Security Operations Center (SOC) for detecting and managing cyber security attacks. An overview of the current techniques and methods for infrastructure monitoring in the context of cyber security is provided, mainly focusing on security information event management (SIEM) systems.

Finally, the last article investigates uncertainties in typical small-signal and large-signal amplifier parameters measured using a vector network analyzer (VNA). Methods to evaluate the measurement uncertainty in return losses, input power, output power, power gain, and 1 dB compression point are discussed and applied to a commercial amplifier between 0.5 GHz and 8 GHz.

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