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EDITORIAL

Announcing the 2015 *Measurement Science and Technology* outstanding paper awards

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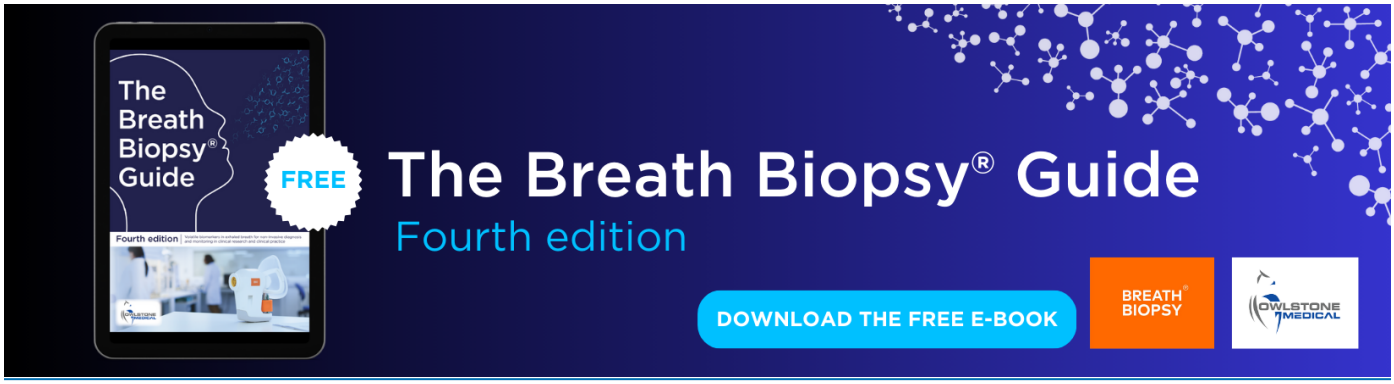

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Editorial

Announcing the 2015 *Measurement Science and Technology* outstanding paper awards

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Since 1991, *Measurement Science and Technology* (MST) has awarded a Best Paper prize. The Editorial Board of this journal believe that such a prize is an opportunity to thank authors for submitting their work, and serves as an integral part of the on-going quality review of the journal.

The current breadth of topical areas that are covered by MST has made it advisable to expand the recognition of excellent publications. Hence, since 2005 the Editorial Board have presented 'Outstanding Paper Awards'. This year awards were presented in the areas of Optical and Laser-based Techniques, Measurement Science, Sensors and Sensing Systems, and Biological, Medical and Life Sciences. Although the categories broadly mirror subject sections in the journal, the Editorial Board consider articles from all categories in the selection process.

2015 award winner—optical and laser-based techniques

Asynchronous electro-optic sampling of all-electronically generated ultrashort voltage pulses

Heiko Füser[1], Mark Bieler[1], Sajjad Ahmed[2] and Frans Verbeyst[2]
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The selected paper [1] derives a laser-based asynchronous optical sampling (ASOPS) technique to measure the output waveform of a next-generation electrical pulse generator. The experimental results demonstrate that an accurate waveform reconstruction of a 13 ns voltage pulse can be constructed through the collection of a large number of measurements, combined with software processing of the data. The sampling of multiple measurements also provides a detailed uncertainty analysis of the measured waveform.

The significance of this work is that the laser-based ASOPS technique enables the highly accurate measurement of purely electrical generated waveforms in next-generation pulse generators (previous techniques have focused on optically generated signals). Time-domain optoelectronic techniques are widely used in precision metrology for the investigation of transfer functions, reflection coefficients or other propagation effects of electronics systems and structures. For example, the laser-based ASOPS technique could serve as harmonic phase references for the calibration of modulated radio frequency and microwave signals. As a result, the laser-based ASOPS technique has broad application for the quantification of next-generation pulse generator transfer functions.

We have selected this article due to its fundamental contribution to measurement science in establishing a laser based technique for precision metrology. The authors have presented a thorough analysis of the measurement technique performance, including quantifying uncertainties and analyzing the effects of measurement time and frequency offsets.

2015 award winner—measurement science

High-resolution velocimetry in energetic tidal currents using a converged-beam acoustic Doppler profiler

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This paper [2] provides a valuable measurement methodology for underwater velocimetry which has applicability to 3D tidal flow velocities in the marine sector. Although divergent-beam acoustic Doppler profilers (D-ADPs) and acoustic Doppler velocimeters have conventionally been used for tidal flow measurements, these methods have significant limitations of the spatial and temporal resolution. The authors developed a geometrically convergent array of acoustic Doppler profiler (C-ADP) to overcome these challenges and tested in an energetic tidal site. The significance of this work is that they achieved the focal point of 0.03 m^3 of the four converged bins of the C-ADP and the reconstruction of 3D velocity components in inhomogeneous flows. The spectral analysis of fluctuating velocity in the turbulent flow indicated that the spectrum in the higher frequency region using the C-ADP follows the theoretical cascade of turbulence energy. Moreover, they achieved the significant improvement in the Doppler noise reduction by up to 47%.

The paper is excellent in its clarity and scientific description and its contents were supported by 26 references. Following the informative introduction, the C-ADP instrumentation has been clearly described and the result is convincing, because the velocities obtained by the C-ADP has been fully validated in compassion with those by the D-ADP and single-beam acoustic Doppler profilers. Its conclusions contain an in-depth summary.

This paper was downloaded more than 500 times in the first 90 d after publication. The selection committee members for the Measurement Science Award selected this paper from a strongly competitive list of candidates because of its sophisticated idea and originality. Considering its impact on significant improvement of underwater velocimetry, the paper was selected as the winner of the MST Measurement Science Award for 2015.

2015 award winner—sensors and sensing systems

Large carbon cluster thin film gauges for measuring aerodynamic heat transfer rates in hypersonic shock tunnels

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In their winning paper [3] the authors presents the design, fabrication, and characterization of a carbon based thermal sensor suitable for a highly demanding application of thermal measurements in high-enthalpy, hypersonic flow condition. Large carbon cluster (LCC) based thin film gauges for the measurement of the heat transfer rates in hypersonic shock tunnels are presented. The thermal sensors are deposited on Macor substrate inserts by the pyrolysis of benzene and ferrocene at 1023 K. Morphological characterization of the films is presented using scanning electron images while active carbon identification was confirmed using Raman Spectra. LCC film based thermistor characterization is presented and thermal models on Macor substrate are presented. LCC thermal gauges have been used to measure the stagnation point heat flux rate over a space-capsule recovery experiment model and a 120° apex angle blunt cone body at flow Mach number of 6.8. Under these test conditions, the LCC layer of the thermal gauge encounters high shear forces and a hostile environment for test durations in the range of few milliseconds. The measured temperature values are found to match well with the theoretical estimates. Furthermore the performance of the LCC thin film gauges has been compared with the performance of traditional platinum thin film gauges by simultaneously measuring the heat transfer rates over the 120° apex angle blunt cone model in hypersonic flow using the two types of gauges. As compared to platinum thin film gauges, the LCC based thin film thermal gauges show better stability and faster response.

2015 award winner—biological, healthcare and life sciences

Rapid and accurate broadband absorption cross-section measurement of human bodies in a reverberation chamber

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This paper [4] reports on the optimisation of an experimental methodology to find the average electromagnetic absorption cross-section of human subjects in a reverberation chamber over the frequency range 1–15 GHz. This work is highly complementary to the numerical simulation approach widely used in the literature for human exposure studies.

In addition to validation of the proposed methodology using Mie series calculations and a spherical phantom, the authors consider the practical issues relating to taking measurements from human subjects, including achievable posture, amount of clothing worn, and time for measurement. They have applied the state of the art in electromagnetic absorption cross-section measurement in order to minimise the time required to collect accurate data, optimising both system and methodology. There is consideration of statistical and systematic uncertainties, over a number of measurements and a range of frequencies.

This paper considers the underlying phenomena involved in electromagnetic absorption cross-section measurements, and combines this with discussion of how these can best be used for implementation in real world applications. There exist in the literature many papers on computation of the exposure of the human body to electromagnetic radiation, and it is fitting for *Measurement Science and Technology* to celebrate a paper that concentrates on practical measurements. It is a pleasure to give the 2015 Outstanding Paper Award in the category of Biological, Healthcare and Life sciences to this paper.

References

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