



# Introduction to the Acta IMEKO Thematic Issue 'IMEKO TC15 Collegium 2026' – Part 1

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Dear Readers,

This Thematic Issue of Acta IMEKO presents the first collection of papers originating from the IMEKO TC15 Collegium 2026, held in Prague, Czech Republic, from 10 to 12 June 2026. The Collegium was organised by the Institute of Theoretical and Applied Mechanics of the Czech Academy of Sciences under the auspices of IMEKO Technical Committee 15 – Experimental Mechanics.

The meeting brought together researchers working in experimental mechanics, material characterisation, damage analysis and structural health monitoring. Particular attention was given to advanced experimental techniques, X-ray computed tomography, dynamic testing and computational methods. In keeping with the traditional format of the TC15 Collegium, the meeting was deliberately focused on scientific discussion and interaction, providing space not only for presenting recent results but also for exchanging ideas and establishing new collaborations.

The six papers included in this first part of the Thematic Issue reflect this broad scope. Nepelius et al. [1] investigate a few-shot learning approach for three-dimensional super-resolution of computed tomography (CT) data using synthetic CT images. By reducing the amount of experimentally acquired high-resolution training data required for the learning process, the proposed approach addresses one of the practical limitations of data-driven super-resolution methods. This is particularly relevant for XCT applications, where acquiring high-resolution volumetric training data can be experimentally demanding and time-consuming.

Three laboratory XCT configurations for non-destructive evaluation and damage visualization in steel wire ropes are compared by Kytýř et al. in [2]. The study demonstrates how different combinations of X-ray source, detector and acquisition parameters affect image quality and the visibility of individual rope components and damage features. The results provide

practical guidance for selecting an XCT configuration according to the required level of detail while considering acquisition time and experimental complexity.

Dvořák et al. [3] investigate the performance of an asynchronous time integration scheme for numerical simulations of Split Hopkinson Pressure Bar experiments. The proposed approach allows different parts of the numerical model to be integrated using different time steps, reducing the computational cost associated with the very small stable time step imposed by the finest discretization. The study demonstrates the potential of this strategy for more computationally efficient simulation of dynamic experiments while maintaining the accuracy required for their interpretation.

A spiral XCT approach for imaging long wooden samples that exceed the conventional field of view of laboratory tomography systems is subject of an investigation by Rada et al. in [4]. The study evaluates the influence of the spiral pitch and geometric calibration on reconstruction quality, identifying their importance for obtaining reliable volumetric data from extended specimens. The approach expands the applicability of laboratory XCT to objects whose dimensions would otherwise prevent their examination in a single conventional scan.

Vavro et al. [5] investigate crack propagation in anisotropic rocks during compressive strength testing using simultaneous gas-permeability measurements. The evolution of permeability provides additional information on the development and connectivity of the internal fracture network that cannot be obtained from the mechanical response alone. The combined approach therefore contributes to a more comprehensive characterization of progressive damage in anisotropic rock materials.

The last article deals with polymer additive manufacturing, especially with stereolithography. In [6], Doktor et al. characterize the mechanical response of stereolithography-produced photopolymer resins under both quasi-static and

dynamic loading conditions. The experiments quantify their strain-rate-dependent behaviour and provide the data required for calibration of the Cowper-Symonds constitutive model. The resulting material parameters facilitate the implementation of these increasingly used additively manufactured polymers in numerical simulations involving dynamic loading.

Together, these contributions illustrate the combination of experimental, imaging and computational approaches that characterises current research within TC15. We would like to thank all authors, reviewers and colleagues involved in the organisation of the Collegium and in the preparation of this Thematic Issue.

We hope you will enjoy your reading.

Daniel Kytýř, Emina Hadzalic and Zvonimir Tomičević  
Section Editors

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