Challenges in metrology of bio-mimicking microphantoms for quantitative phase imagining: perspective

Metrology & Hallmark

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Abstract

Quantitative Phase Imaging (QPI) refers to 2D and 3D microscopy techniques that provide contrast by quantifying the phase changes in the wavefront when light propagates through specimen. The QPI is particulary useful as advanced imaging and measurement tool in biomedical research, but its performance is sample-dependent and cannot be reliably characterized with conventional approach to metrology. In order to benchmark the QPI system it is crucial to use phantoms that represent key details of the sample in realistic working conditions, and evaluate the system in an end-to-end fashion. This work summarizes the metrological needs for the QPI, as well as presents 3D-printed phantoms ranging from simple bars, steps, cells and cell cultures, up to volumetric and scattering phantoms mimicking tissues or organoids. If such phantoms could be characterized by traceable and celibrated instruments, they would become invaluable tool to certify QPI instruments and enable reliable measurement outcomes.

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