Supplemental Document

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Dual-modality digital holographic and polarization microscope to quantify phase and birefringence signals in biospecimens with a complex microstructure: supplement

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Figure S1 depicts the polarization state generator settings used in the five-image algorithm to compute retardance and azimuth maps based on birefringence signal from a biospecimen. The choice of polarization settings influences computed polarization parameter error terms, for example in Mueller matrix polarimetry using photoelastic modulators, for which optimized settings have been determined [1]. The settings used in this study were taken directly from [2], the authors of which mention that other polarization settings are possible (for example using the south pole of the Poincaré sphere for setting Σ_0 leading to image I_0). The five-image acquisition with polarization states depicted in Figure S1 were used due to 1) the high sensitivity to retardance and low noise demonstrated in [2], 2) the ability to use a background subtraction procedure to reduce the background further, and 3) the equal sensitivity to all azimuthal orientations apparent from the symmetry of the four elliptical polarization settings.

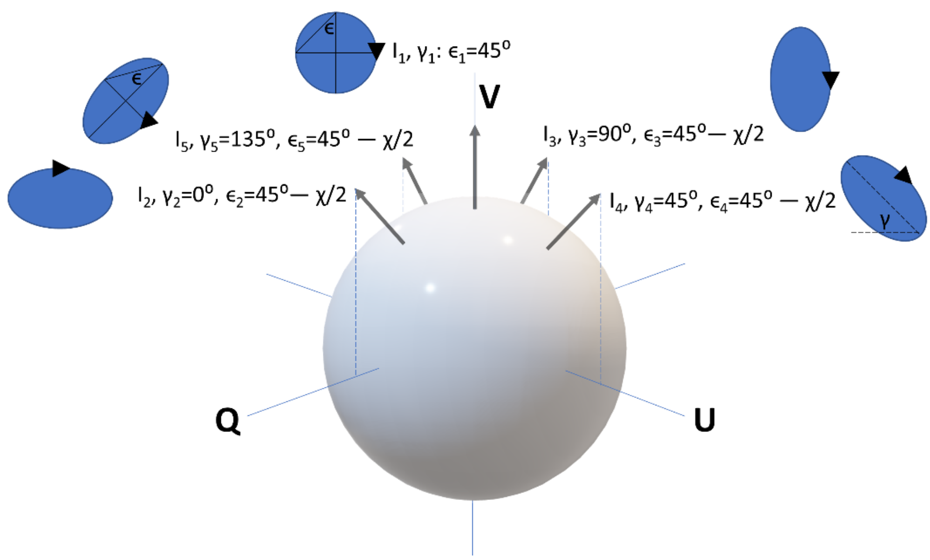

Fig. S1. Five image settings and liquid crystal variable retarder settings for the polarization state generator of the polarization module, presented on the Poincaré sphere. The five image settings related to images I_1 through I_5 are represented as the intersecting points of 5 gray arrows on the sphere. Blue lines are the three Poincaré sphere axes (Q, U, V). The polarization ellipse generated by each setting is represented in blue, with the auxiliary angle (ϵ), major axis angle (γ) and swing retardance (χ) also indicated.

Figure S2 depicts the USAF 1951 phase resolution target, sputter coated with Molybdenum to possess a phase height of 350 nm. The large square was used for repeated phase calibrations of the digital holographic microscope.

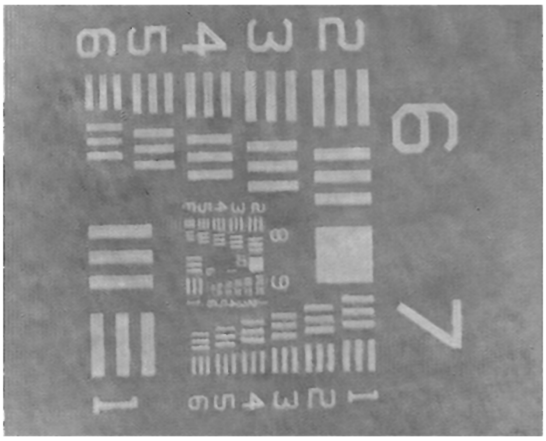

Fig. S2. Phase map reconstructed from hologram of a 350 nm phase height target slide. The 1951 USAF resolution target was sputter-coated with a Molybdenum film. Phase height of the large square was measured over several trials to assess measurement repeatability.

References

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2. M. Shribak, and R. Oldenbourg, "Techniques for fast and sensitive measurements of two-dimensional birefringence distributions," Appl Opt **42**, 3009-3017 (2003).