# LOW-COHERENCE INTERFERENCE MICROSCOPE IN TRANSMISSION MODE

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Our system is based on the Mach-Zehnder interferometer with a diffraction grating as a beam splitter. A beam combiner is not used. The interferometer arms intersect gently inclined to each other so the interference structure is an image–plane hologram. The technique is also named incoherent holography with a spatial–domain carrier. The hologram is recorded using a CCD camera and processed by a computer.

The phase image component may be extracted from the hologram in addition to the intensity one. The latter is depth discriminated as it is in a classical confocal microscope. This effect is a consequence of the spatial incoherence of illumination (correlation effect) that, in the reflection–mode microscope [1], could be with benefit combined with the temporal one. The advantage of this technique is that the optical section is formed at a time without any need of scanning.

The setup is built to be achromatic – the interference structure in the output plane of the interferometer is achromatic within the entire field of view. Hence a white-light (broad) source may be used which solves the problems with coherent light – image degradation by speckles or by unintended interference.

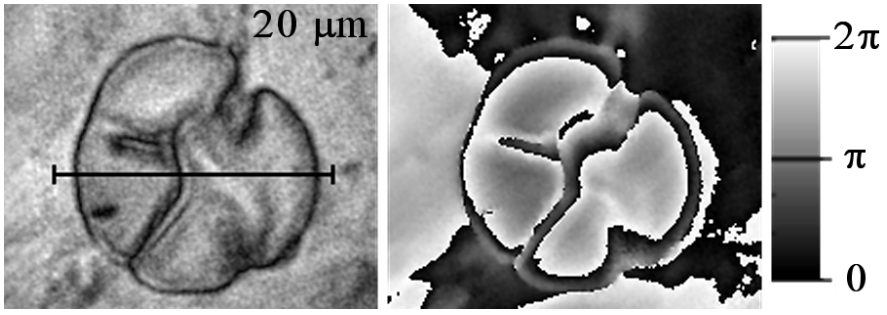


Figure 1: Intensity and phase images, respectively, of a bean starch grain. Objectives 40x/0.65, halogen-lamp illumination, narrow-band filter ($\lambda = 650$ nm).

Optical path difference (OPD) measurement enhanced by the optical sectioning is demonstrated experimentally in the paper.

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## References

[1] R. Chmelík, Z. Harna, "Parallel–mode confocal microscope," *Optical Engineering,* **38,** 1635–1639 (1999).