

Abstract Submitted
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Electronically Controlled Condensers for Sub-Wavelength Microscopy SANCHARI SEN¹, DONGYU CAO², AYRTON BERNUSI³, LUIS GRAVE DE PERALTA⁴, Texas Tech University — We are exploring the use of hemispherical Electronically Controlled Condensers (ECCs) with no moving parts, lenses, or mirrors, to improve the sub-wavelength resolution capabilities of optical microscopes. ECCs consist of a number of light emitting diodes (LED) placed inside a hollow hemisphere. Electronically controlling individual or groups of LEDs spatially and temporally gives the condenser numerous advantages over common optical condensers. ECCs are a simple solution to achieve a variable numerical aperture (NA) depending on the illumination incident angle. Our approach allows for the realization of bright field ($NA_O > NA_c$) and dark field ($NA_O < NA_c$) optical microscopy in the same setup. We anticipate a number of applications for ECCs. LEDs emitting at different wavelengths, will enable the realization of quasi-monochromatic or polychromatic ECCs where the wavelength selection will be determined by the microscopy application. Near IR optical Tomography and panoramic microscopy can be realized by controlling the spatial and temporal illumination of the LEDs. ECCs can also be used to perform Fourier Ptychography to achieve both wide-field view and high resolution.

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