Digital pathology is an emerging clinical practice in which a pathologist makes a diagnosis on digital images of tissue slides [1]. These images are acquired with a high-resolution (down to 0.25 μm/pixel), high-throughput (scan time 1 min for postage stamp sized area) whole slide scanning microscope. Several systems are available based on the use of line-scan camera’s, often with Time Delay Integration (TDI) capability. Here we present a systematic method to evaluate the optical quality of whole slide scanners from the Modulation Transfer Function (MTF) extracted from the edge response over a resolution target [2]. The pattern of the resolution target consists of dark and bright bars in two areas with normal in the sagittal and tangential direction. The through-focus MTF enables the determination of the best focus as a function of the field position for the sagittal as well as tangential edge normal orientation, and also for the different colour channels. This provides a direct measurement of field curvature, astigmatism, and axial colour. The curvature of the best focus line as a function of spatial frequency is a measure for spherical aberration. The through-focus MTF measurement is a suitable tool to test different objective lens-tube lens assemblies and to monitor the optical quality of individual slide scanners. In the presentation we will give a detailed account of the different image processing steps (averaging and noise suppression, calibration of the resolution target tilt), and present results on different objective lens-tube lens assemblies, and compare these to Shack-Hartmann tests of objective lenses and Zemax raytracing results.

Through-focus MTFs for region E with the best focus line (left). Resolution target pattern and regions of interest (middle). Best focus showing field curvature and astigmatism (right).