

The Phase Focus Virtual Lens® Metrology of Hydrated Contact Lenses

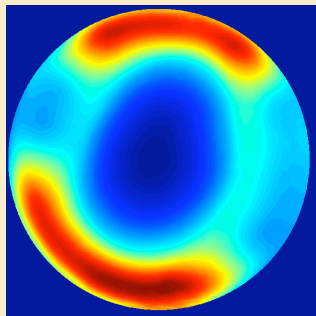
For contact lens wearers, oxygen flux is the single most important determinant of corneal health. Therefore, an accurate method is required to measure oxygen transmissibility over the lens area.

Oxygen transmissibility is inversely proportional to local lens thickness, and is currently typically reported using nominal centre lens thickness information.

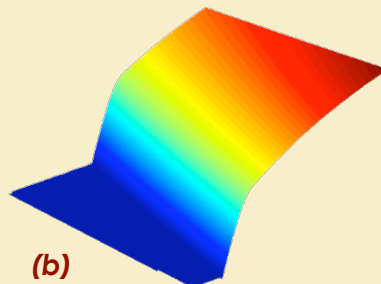
However, many modern lens designs (particularly torics) have complex spatially-varying thickness profiles. For such lenses, estimation of oxygen transmissibility using only a centre thickness measurement can be substantially misleading.

The Phase Focus Virtual Lens® is a phase retrieval algorithm that provides a quantitative measure of how much the phase of an illuminating beam changes as it passes through the lens, and can be used to map out the thickness profiles of lenses in their fully hydrated state.

The Virtual Lens metrology capability may be incorporated into conventional laboratory microscope instrumentation (right), or may be implemented in a custom on- or at-line manufacturing process control environment.



(a)



(b)



Virtual Lens TruWave™ Depth images of a fully-hydrated toric contact lens: The whole lens image (a) has lateral resolution of $\sim 6\mu\text{m}$, and shows thickness on a colour scale from blue (thinnest) to red (thickest.) The lens edge thickness profile from a selected area of the same lens, shown here in a 3D plot format (b), has a lateral resolution of $\sim 1\mu\text{m}$. In both cases, the thickness sensitivity is $\sim 0.1\mu\text{m}$.